U.S. National Report to ICCAT, 2003

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1. NATIONAL FISHERIES INFORMATION

Total (preliminary) reported U.S. catch of tuna and tuna-like fishes (including swordfish, but excluding other billfishes) in 2003 was about 27,000 MT, an increase of about 9% from about 25,000 MT in 2002. Estimated swordfish catch in 2003 (including estimated dead discards) marginally decreased (25 MT) and was about 2,800 MT. Provisional landings from the U.S. fishery for yellowfin in the Gulf of Mexico increased in 2003 to about 2,500 MT from about 2,400 MT in 2002. The estimated 2003 Gulf of Mexico landings of yellowfin tuna accounted for about 33% of the estimated total U.S. yellowfin landings in 2003. U.S. vessels fishing in the northwest Atlantic landed in 2003 an estimated 1,489 MT of bluefin, a decrease of 400 MT compared to 2002. Provisional skipjack landings decreased by 9 MT to 78 MT from 2002 to 2003, estimated bigeye landings decreased by 117 MT compared to 2002 to an estimated 483 MT in 2003, and estimated albacore landings decreased from 2002 to 2003 by 39 MT to 449 MT.

2. STATISTICS AND RESEARCH

In addition to monitoring landings and size of swordfish, bluefin tuna, yellowfin tuna, billfish, and other large pelagic species through continued port and tournament sampling, logbook and dealer reporting procedures, and scientific observer sampling of the U.S. fleet, major research activities in 2002 and 2003 focused on several items. Research on development of methodologies to determine the genetic discreteness of large pelagic fishes in the Atlantic was continued as were larval surveys for bluefin tuna and other large pelagics in the Gulf of Mexico. Research on development of robust estimation techniques for population analyses and on approaches for characterization of uncertainty in assessments and methods for translating that uncertainty into risk levels associated with alternative management approaches was further conducted. U.S. scientists also continued to coordinate efforts for the ICCAT Enhanced Research Program for Billfish and for the Bluefin Year Program. Participants in the Southeast Fisheries Science Center's Cooperative Tagging Center (CTC) and the Billfish Foundation tagging program tagged and released 4,829 billfishes (swordfish, marlins, sailfish, and spearfish) and 608 tunas in 2003. This represents a decrease of 43% for billfish and a 9% decrease for tunas from 2002 levels. Electronic tagging studies of bluefin tuna and of marlins were substantially enhanced. Cooperative research was conducted with scientists from other nations on development of assessment methodologies, on biological investigations and on development of indices of abundance for species of concern to ICCAT.

2.1 Fisheries Statistics

2.1.1 Tropical Tuna Fishery Statistics

Yellowfin Tuna. Yellowfin is the principal species of tropical tuna landed by U.S. fisheries in the western North Atlantic. Total estimated landings increased to 7,702 MT in 2003, from the 2002 landings estimate of 5,710 MT (Appendix Table 2.1-YFT). The 2003 estimate is considered provisional and may change owing to incorporation of late reports of commercial catches as they become available and to possible revisions in estimates of rod & reel catches made by recreational anglers. A high proportion of the estimated landings were due to rod & reel catches of recreational anglers in the NW Atlantic (4,672 MT). Estimates of U.S. recreational harvests for tuna and tuna-like species continue to be reviewed and this may result in the need to report additional revisions to the available estimates in the future. Nominal catch rate information from logbook reports (longline catch per 1,000 hooks) for yellowfin by general fishing areas is shown in Appendix Figure 2.1-YFT.

Skipjack Tuna. Skipjack tuna also are caught by U.S. vessels in the western North Atlantic. Total reported skipjack landings (preliminary) decreased from 89 MT in 2002 to 78 MT in 2003 (Appendix Table 2.1-SKJ). Estimates of recreational harvests of skipjack continue to be reviewed and could be revised again in the future. Appendix Figure 2.1-SKJ presents nominal catch rate information (longline catch per 1,000 hooks) based on fishing logbook reports.

Bigeye Tuna. The other large tropical tuna reported in catches by U.S. vessels in the western North Atlantic is bigeye tuna. Total reported catches and landings (preliminary) for 2003 decreased by 117 MT from 600 MT in 2002 to 483 MT (Appendix Table 2.1-BET). Note that like yellowfin, the estimates of rod & reel catch are considered provisional and may be revised based on results of a future review of recreational harvest estimates. Appendix Figure 2.1-BET presents nominal catch rate information (longline catch per 1,000 hooks) based on fishing logbook reports.

2.1.2 Temperate Tuna Fishery Statistics

Bluefin Tuna. The U.S. bluefin fishery continues to be regulated by quotas, seasons, gear restrictions, limits on catches per trip, and size limits. To varying degrees, these regulations are designed to restrict total U.S. landings and to conform to ICCAT recommendations. U.S. 2003 provisional estimated landings and discards from the northwest Atlantic (including the Gulf of Mexico) was 1,481 MT. Those estimated landings and discards represent a decrease of 401 MT from the 2002 estimates. The 2003 landings by gear were: 265 MT by purse seine, 88 MT by harpoon, 3 MT by handline, 81 MT by longline (of which 54 MT were from the Gulf of Mexico), 991 MT by rod and reel (of which, 315 MT was the preliminary estimate for bluefin less than 145 cm SFL from off the northeastern U.S.).

In response to 1992 regulations limiting the allowable catch of small fish by U.S. fishermen, in conformity with ICCAT agreements, enhanced monitoring of the rod and reel fishery was implemented in 1993 for the purpose of providing near real-time advice on catch levels by this fishery. This monitoring activity has continued and has included estimation of catches by finer scale size categories than reported above. The preliminary estimates for the 2003 rod and reel fishery off the northeastern U.S. (including the North Carolina winter fishery) for landings in several size categories were 73 fish < 66 cm, 7,598 fish 66-114 cm, 4,481 fish 115-144 cm and 1,517 fish 145-177 cm (an estimated 0.33, 138, 177, and 111 MT, respectively). Note that additional rod and reel landings of bluefin >177 cm SFL, monitored through a sales reporting system, are included in Table 2.2-BFT.

Albacore. Albacore are landed by U.S. vessels; however, historically, albacore has not been a main focus of the U.S. commercial tuna fisheries operating in the North Atlantic. Reported commercial catches were relatively low prior to 1986; however, these catches increased substantially and have remained at higher levels throughout the 1990s, with nearly all of the production coming from the northeastern U.S. coast. The U.S. landings from the Caribbean increased in 1995 to make up over 14% of the total U.S. harvest of albacore, but have since remained below 4% of the total. Nominal catch rate information from U.S. longline logbook reports are shown in Appendix Figure 2.1-ALB. Estimated total catches of albacore were 449 MT in 2003, a decrease of 39 MT from 2002 (Appendix Table 2.2-ALB).

2.1.3 Swordfish Fishery Statistics

For 2003 the provisional estimate of U.S. vessel landings and dead discards of swordfish was 2,821 MT (Appendix Table 2.3-SWO). This estimate is only slightly lower than the estimate of 2,846 MT for 2002. The provisional landings, excluding discard estimates, by ICCAT area for 2003 (compared to 2002) were: 441MT (455 MT) from the Gulf of Mexico (Area 91); 1,195 MT (1,041MT) from the northwest Atlantic (Area 92); 273 MT (312 MT) from the Caribbean Sea (Area 93); and 613 MT (576 MT) from the North Central Atlantic (Area 94A), and 20 MT (199 MT) from the SW Atlantic (Area 96).

U.S. swordfish landings are monitored in-season from reports submitted by dealers, vessel owners and captains, NMFS port agents, and mandatory daily logbook reports submitted by U.S. vessels permitted to fish for swordfish. This fishery is also being monitored via a scientific observer sampling program, instituted in 1992. Approximately 5% of the longline fleet-wide fishing effort is randomly selected for observation during the fishing year. In the past few years, the target sampling coverage has been elevated to 8%. The observer sampling data, in combination with logbook reported effort levels, support estimates of approximately 22,600 fish discarded dead in 2003. For the North Atlantic, the estimated tonnage discarded dead in 2003 is 278 MT, of which 273 is estimated due to longline gear. Overall, the estimates of dead discarded catch slightly increased by 15 MT compared to the 2002 level, but remained about 10% of the landed catch.

Total weight of swordfish sampled for sizing U.S. landings by longline, otter trawl, and handline was 2,443 MT, 1.5 MT, and 8 MT in 2003. The weight of sampled swordfish landings in 2003 were 98%, 25%, and 68% of the U.S. total reported annual landings of swordfish for longline, trawl, and handline. Again, incorporation of late reports into the estimated 2003 landings figure will likely result in changes in the sampled fraction of the catch. Recent estimates of rod and reel landings of swordfish based on surveys of recreational anglers, range from about 5-48 MT per year within the period 1996-2003.

2.1.4 Marlins and Sailfish Fishery Statistics

Due to concerns over estimates of rod and reel catches and landings of marlins, estimates for 2002 and 2003 were reviewed by a scientific committee convened to advise on the appropriateness of the methods and data used and to recommend future improvements needed to reduce uncertainty in the estimates. Removals from recreational fishing tournaments monitored through the Recreational Billfish Survey (RBS) represent a portion of total removals and thus represent an underestimate of total removals by recreational anglers. Removals based solely on RBS will not be adequate for stock assessments which must consider all removals.

The estimates of 2003 U.S. rod and reel landings from the RBS for blue and white marlins were 19 MT and 0.6 MT, respectively. The estimated 2003 rod and reel landings of sailfish were 53 MT.

Estimates of the billfish bycatch discarded dead in the U.S. longline and other fisheries for 2003 were 19 MT for blue marlin, 16 MT for white marlin, and 5 MT for sailfish. The estimated 2002 U.S. discarded dead bycatch was 48 MT, 33 MT, and 7 MT, respectively for the three species.

2.1.5 Mackerels Fishery Statistics

Significant catches of king and Spanish mackerels by U.S. fishermen have occurred since the 1850's for Spanish mackerel and since the 1880's for king mackerel. The major gears currently exploiting these species are handlines and gillnets. Purse seines were also used to harvest king mackerel during the 1980's. Gillnets have historically been the main commercial gear for Spanish mackerel however in recent years, recreational removals have become an important component in total catches for both species. The majority of king mackerel catches are taken off North Carolina and Florida and it is believed that a major production area off Louisiana, is recovering. The primary Spanish mackerel catch areas include the Chesapeake Bay and Florida. Current fisheries are co-managed under the Coastal Migratory Pelagic Resources FMP enacted in 1983 and regulations adopted by the South Atlantic and Gulf of Mexico Fishery Management Council and implemented by NMFS. Annual catches are monitored closely by NMFS and within season management measures include commercial trip limits, size limits, seasonal and area quotas, and recreational per person daily bag limits. Because these species occur in both federal and state territorial zones of U.S., successful management has required participation by both federal and state management agencies. At present, none of the king or Spanish mackerel stocks are any longer considered overfished.

Annual yields of king mackerel have ranged from 4,365 MT to 8,772 MT between 1983 and 2003 with an average production of about 7,000 MT since 1995. Annual catches of Spanish mackerel have ranged from 2,784 MT to 5,957 MT from 1983 to 2003 with the average catch of about 4,500 MT since 1995. Reported 2003 U.S. catches of king mackerel and Spanish mackerel are preliminary. The reported landings of king mackerel and Spanish mackerel were 6,983 mt and 4,6111 MT, respectively.
Harvest of both species has stabilized in recent years although large fluctuations in estimates of recreational catches in some years have occurred and overages in commercial landings and recreational quotas can occur. The stabilization in yields is thought to be the direct impact of regulations which have been implemented in an effort to sustain future production. The primary management factors contributing to fluctuations in annual recreational harvests include difficulties of enforcement of differential bag limits imposed in individual states, large inter-annual variances in recreational harvest estimates, and regulations that permit the sale of king mackerel from recreational charter boats after the closure of commercial fisheries.

2.1.6 Shark Fishery Statistics

The U.S. Federal Fisheries Management Plan (FMP) implemented in 1993 (NMFS 1993) identified three management groups: large coastal sharks, small coastal sharks, and pelagic sharks. The pelagic complex included ten species: shortfin mako (*Isurus oxyrinchus*), longfin mako *(Isurus paucus*), porbeagle (*Lamna nasus*), thresher (*Alopias vulpinus*), bigeye thresher (*Alopias superciliosus*), blue (*Prionace glauca*), oceanic whitetip (*Carcharhinus longimanus*), sevengill (*Heptranchias perlo*), sixgill (*Hexanchus griseus*), and bigeye sixgill (*Hexanchus vitulus*). The 1993 FMP classified the status of pelagic sharks as unknown because no stock assessment had been conducted for this complex. The Maximum Sustainable Yield (MSY) for pelagic sharks was set at 1,560 mt dressed weight (dw), which was the 1986-1991 commercial landings average for this group. In 1997, as a result of indications that the abundance of Atlantic sharks had declined, commercial quotas for large coastal, small coastal, and pelagic sharks were reduced. The quota for pelagic sharks was set at 580 mt. In 1999, the U.S. FMP for Atlantic Tunas, Swordfish, and Sharks (NMFS 1999) proposed the following measures affecting pelagic sharks: 1) a reduction in the recreational bag limit to 1 Atlantic shark per vessel per trip, with a minimum size of 137 cm fork length for all sharks, 2) an increase in the annual commercial quota for pelagic sharks to 853 mt dw, apportioned between porbeagle (92 mt), blue sharks (273 mt dw), and other pelagic sharks (488 mt dw), with the pelagic shark quota being reduced by any overharvest in the blue shark quota, and 3) making the bigeye sixgill, sixgill, sevengill, bigeye thresher, and longfin mako sharks prohibited species that cannot be retained. All these regulations were implemented in 1999 and have been in effect since then.

Landings of sharks by US longline fishermen holding permits to land and sell swordfish caught in the Atlantic and dead discards of sharks in the US longline fleet targeting tunas and tuna-like species are monitored and reported to ICCAT. There are also additional catches and landings of Atlantic pelagic sharks across the range of US fleets that harvest them, including recreational fisheries, that are updated annually. These total catches are updated herein up to 2002 (although some of the data for 2002 are preliminary and subject to change) in anticipation of an assessment of pelagic sharks by ICCAT in 2004. Commercial landings of pelagic sharks steadily increased from the early 1980's, peaked in 1995, and have shown a declining trend since that year (Appendix Table 2.6a-SHK). Recreational landings in numbers estimated from the MRFSS survey during 1981-2002 peaked to a maximum of 93,000 fish in 1985, and showed a declining trend since that year, fluctuating between about 42,600 fish in 1986 to about 3,800 fish in 2001 (Appendix Table 2.6a-SHK). Pelagic longline dead discards also fluctuated between 1987 and 2002, but generally declined from a maximum of 30,500 fish in 1993 to a minimum of about 3,500 fish in 1999. Total catches ranged from about 12,500 fish in 1981 (no commercial landings or discard estimates were available for that year) to about 95,000 fish in 1985, as a result of the peak in recreational landings that year.

Blue shark (*Prionace glauca*) commercial landings were generally very low (Appendix Table 2.6b-SHK). Recreational landings in numbers ranged from about 500 fish in 1994 and 1995 to over 20,000 fish in 1987. Pelagic longline discards reached 29,000 fish in 1993, but otherwise oscillated between a minimum of about 2,800 fish in 1999 to a maximum of about 19,000 fish in 1996 (Appendix Table 2.6b-SHK). The trends in recreational landings and dead discards were very similar from 1992 to 1997. Total catches ranged from 0 fish in 1982 (a year in which no commercial or recreational landings were reported) to about 43,500 fish in 1993, the year in which dead discard estimates peaked (Appendix Table 2.6b-SHK).

Shortfin mako (*Isurus oxyrinchus*) commercial landings never exceeded 5,000 fish according to available estimates (Appendix Table 2.6c-SHK). Commercial landings from 1995 to 2002 in the quota monitoring and general canvass data collection programs are also assigned to an unclassified "mako" category, in addition to the "shortfin mako" category. Adding these landings of unclassified makos, which are likely to be shortfin makos, would increase commercial landings for this species, but would not affect significantly total catches. Most of the landings were attributable to the recreational fishery, whose landings in numbers peaked in 1985 to about 80,000 fish, and ranged from less than 1,400 fish to over 31,000 fish in the remaining years. Pelagic longline discards of shortfin makos were negligible. Total catches ranged from about 3,500 fish in 1999 to almost 82,000 fish in 1985, when recreational catches peaked (Appendix Table 2.6c-SHK).

Catches of other pelagic species, such as longfin mako (*Isurus paucus*), oceanic whitetip shark (*Carcharhinus longimanus*), porbeagle (*Lamna nasus*), bigeye thresher (*Alopias superciliosus*), and thresher shark (*Alopias vulpinus*) were very small. Only for thresher shark, did total landings exceed 1,000 fish for more than one year in a row.

2.2. Research Activities

Research continued on genetic discreteness of large pelagic fishes in the Atlantic, larval surveys for bluefin tuna and other large pelagics in the Gulf of Mexico, new methods for estimating and indexing abundance, robust estimation techniques for sequential population analyses, and estimating discards based on direct observations by scientific fishery observers. Research was also conducted on approaches for characterization of uncertainty in assessments and methods for translating that uncertainty into risk levels associated with alternative approaches. U.S. scientists also continued to coordinate efforts for the ICCAT Enhanced Research Program for Billfish and for the Bluefin Year Program. Collaborative research with scientists from ICCAT member nations and cooperating parties continues.

2.2.1 Bluefin Tuna Research

As part of its commitment to the Bluefin Program, research supported by the United States has concentrated on ichthyoplankton sampling, reproductive biology, methods to evaluate hypotheses about movement patterns, spawning area fidelity, stock structure investigations and population modeling analyses.

Ichthyoplankton surveys in the Gulf of Mexico during the bluefin spawning season were continued in 2003 and 2004. Data resulting from these surveys which began in 1977 are used to develop a fishery-independent abundance index of spawning west Atlantic bluefin tuna. This index has continued to provide one measure of bluefin abundance that is used in SCRS assessments of the status of the resource. During the 2003 a U.S. scientist participated in the Spanish TUNIBAL project studying the relationships between bluefin larval and adult distributions and hydrography in waters near the Balaeric Islands in the Mediterranean Sea. During the 2004 U.S. ichthyoplankton survey, a plankton net of a type used in the Spanish surveys was fished in addition to the nets normally used to determine the impact of using a wider net mouth and larger mesh on the size and catch rates of bluefin in the Gulf of Mexico.

Scientists at Virginia Institute of Marine Science and Texas A&M University have used nuclear and mitochondrial DNA to investigate the population structure of bluefin tuna in the Mediterranean Sea (SCRS/2004/165). Young of the year bluefin were studied to reduce possible migratory effects. Their results indicate homogeneity within the western Mediterranean basin (Balaeric Islands and Tyrrhenian Sea) and differences between the eastern (Ionian Sea) and western basins. Samples collected for these studies were obtained by or in cooperation with European scientists from multiple locations including Spain and several locations in Italy; financial and logistical assistance was also provided by the ICCAT bluefin year program.

Since 1998, researchers from Texas A & M University and the University of Maryland with assistance of researchers from Canada, Europe, and Japan have studied the feasibility of using otolith chemical composition (microcontituents and isotopes) to distinguish bluefin stocks. Recent research has investigated the value of using additional microconstituent elements (transitional metals) to enhance classification success(see Appendix 3.1-BFT). By themselves the transitional metals provided little discriminatory power, but when combined with the other trace elements (for 13 elements in all), the classification success was improved to about 80-90%. Studies of classification success using oxygen isotopes continue.

Scientist University of Maryland, Virginia Institute of Marine Science and Texas A&M University have continued to sample specimens for genetic and otolith chemistry studies of stock structure. Roughly 10-20 young of the year were collected in 2003. In addition limited sampling of ages 1 and older continues. Efforts are also continuing to obtain samples from juveniles and mature bluefin from the Mediterranean Sea and adjacent waters.

In response to the ICCAT Commission's request for options for alternative approaches for managing mixed populations of Atlantic bluefin tuna SCRS/2003/108 examined approaches to developing more complex models of bluefin population dynamics including detailed spatial information and methods for assessing the resources and examining management procedures. SCRS/2003/105 proposed the evaluation of possible age structured assessment using more complex geographic stratification (6 box) and movement scenarios than have been used in recent assessments and the greater use of Bayesian approaches to more fully model data inputs and population characteristics than is currently done by the SCRS with its conventional VPA analyses. Document SCRS/2004/166 further extends that work and shows that, under the proposed model structure, west Atlantic bluefin population trends from the conventional ICCAT assessments can be replicated while the most recent east Atlantic assessment trends can not. It also corroborated earlier results from 2-area VPAs that showed that estimated west Atlantic population trends are influenced by assumptions about movement rates and patterns. In May 2004 scientists from (1) Stanford University and the Monterey Bay Aquarium and (2) the New England Aquarium and the University of New Hampshire made presentations on their research findings to the SCRS meeting on bluefin tuna management strategies held in France. Researchers at the Imperial College, London are working with the University of Miami, the University of New Hampshire and the National Marine Fisheries Service to develop methods to estimate bluefin movement and fishing mortality rate patterns (SCRS/2004/164). An operational model is being developed which will use conventional and electronic tagging data and fishing effort by management area. The operational model will be used to examine possible harvest control rules and the evaluation of possible management procedures (see Appendix 3.4-BFT).

2.2.2 Swordfish Research

Data from observer samples were compared against self-reported information from the U.S. large pelagic mandatory logbook reporting system, and estimates of discard mortality of swordfish, billfish, sharks and other species from the U.S. fleet were developed from that analysis for the 2003 SCRS. Estimates of small swordfish bycatch for 2002 and 2003 were compared to the average levels estimated for the late 1990's and were found to be substantially lower (see Appendix).

Preliminary evaluations of the comparative effectiveness of closed areas and minimum size measures for the conservation of swordfish stocks were provided in SCRS/04/128. This research establishes a framework within which the conservation equivalency of various minimum size and marine protected area management measures could be evaluated.

Fisher reported and observed swordfish catch, size and catch rate patterns through 2003 were examined in support of monitoring the recovery of north Atlantic swordfish. Standardized indices of abundance were updated for the Western North Atlantic using data from the U.S. pelagic longline fleet (SCRS/04/130).

Research is also underway to improve methods by which tag return data can be incorporated into the next swordfish stock assessment (SCRS/04/129). The approach taken makes use of Bayesian statistical methods to characterize the uncertainty in assessment results.

Collaborative research with Venezuelan scientists continues on estimating the age-structure of the catch of swordfish. Results of this research will be available for the next assessment of north Atlantic swordfish.

Research on measures to mitigate the interactions between pelagic longline and bycatch of marine turtles continued under a cooperative research program involving the US Atlantic pelagic longline fishery. The Northeast Distant Fishery Experiment was conducted from 2001 through 2003 on the high seas of the Western Atlantic Ocean, in an area off New Foundland known as the Grand Banks. In cooperation with Blue Water Fishermen's Association and the Fisheries Research Institute, NOAA Fisheries worked to test various fishing methods, such as bait and gear type, to determine which combinations worked best to minimize sea turtle encounters in pelagic longline fisheries. Thirteen American longline vessels were contracted to carry out the research with NOAA Fisheries scientists and private sector gear developers to find combinations used to achieve up to a 90 percent reduction in fishing gear-sea turtle interactions for leatherbacks and loggerheads. This research also led to development of new gear so fishermen could safely dehook and disentangle the few turtles that were accidentally caught. NOAA Fisheries and partners are now launching an international education initiative to invite all fishing nations with pelagic longline fleets to begin exploring this technology. Gear and techniques developed by this program are being tested in research programs in several countries, and results of this research are being used in other fisheries and countries that operate longline gear. A report on the research progress for this program can be found at http://www.mslabs.noaa.gov/mslabs/docs/watson2.pdf. Other material of interest on this topic can be found at http://www.nmfs.noaa.gov/mediacenter/turtles/.

2.2.3 Tropical Tunas Research

During 2003, several collaborative studies were conducted by U.S. scientists in cooperation with scientists from other countries. Cooperative research by the U.S. NMFS and the INP in Mexico continued and resulted in a joint analysis of US and Mexican longline catch-per-unit-effort (CPUE) of yellowfin in the Gulf of Mexico (SCRS/2003/061). Cooperative research plans include further development of abundance indices for sharks and other tunas, as well as the refinement of the yellowfin tuna indices as additional data become available. Cooperative research on yellowfin tuna abundance indices, catch at age, and life-history studies is also continuing with Venezuelan scientists. One document on Venezuelan longline catch rate patterns resulted from this collaboration in 2003 (SCRS/2003/054) and additional working papers based on this collaboration are expected in future years.

U.S. scientists participated in the 2003 ICCAT Yellowfin Tuna Stock Assessment (Merida, Mexico, July 21-26 2003), and submitted several other working papers. Two relative abundance patterns (one for the Gulf of Mexico and another for the Atlantic regions fished by US longline vessels) based on US pelagic longline data from 1981 to 2002 were presented in SCRS/2003/060. Additionally, a relative abundance index based on data collected through the Large Pelagic Survey from the Virginia-Massachusetts rod and reel fishery (1986-2002) was presented in SCRS/2003/062.

New information from a genetic study was presented in SCRS/2003/063. The phylogenetic analysis conducted on samples from the Gulf of Mexico and Gulf of Guinea by researchers at Texas A&M, Galveston, revealed the presence of siblings in several sampling tows for juvenile tuna. Given the high level of genetic diversity at both the mitochondrial and microsatellite loci, the probability of such sampling is extremely low and can best be explained by the unequal reproductive output of certain females. Increases in vulnerability of juvenile yellowfin tuna could be of concern in terms of genetic integrity of the population if levels of reproductive variance are confirmed to be large.

U.S. scientists also worked in cooperation with outside experts to study alternatives for improving the collection of catch statistics in the U.S. recreational yellowfin tuna fishery. A U.S. scientist attended the Tuna Statistics Meeting (Tema, Ghana, February 2-5 2003) and collaborated with scientists from other nations (including Ghana) in the design of a pilot study to develop a sampling scheme for Ghana's tropical tuna fishery.

During 2004, U.S. scientists participated in both the Bigeye Tuna Year Program (BETYP) Symposium (Madrid, Spain, March 8-9 2004) and the Second World Bigeye Tuna Meeting (Madrid, Spain, March 10-13 2004). Contributed papers included SCRS/2004/038, describing the simulated aggregation of bigeye tuna in free schools versus those associated with fish aggregating devices, and SCRS/2004/059, which reviewed published work on yellowfin tuna growth and compared parameter estimates in the context of potential impact on the catch-at-age matrices used for stock assessment.

U.S. scientists took part in the 2004 ICCAT Bigeye Tuna Stock Assessment (Madrid, Spain, June 28-July 3 2004). For this meeting, relative abundance patterns based on US pelagic longline data from 1982 to 2003 were presented in SCRS/2004/133.

A thorough review of recreational catch estimation procedures was conducted during 2004, focusing on a survey program covering the rod and reel fishery along the Atlantic Coast of the U.S. from Virginia northward.

U.S. scientists also worked cooperatively with scientists in Brazil, instructing a course on CPUE standardization methods and applications to stock assessment (Recife, Brazil, June 7-12 2004).

2.2.4 Albacore Research

In 2003, an analysis of U.S. longline CPUE (SCRS/03/086) was prepared in support of the ICCAT assessment of northern- and southern-Atlantic albacore.

2.2.5 Mackerels and Small Tunas Research

U.S. small tuna research is directed mainly on king and Spanish mackerel stocks as the amount landed of other small tunas such as cero mackerels by U.S. fishermen is very low. The focus of research is collection of primary fishery catch statistics, and biostatistical sample data, fishery age samples, and abundance indices. Critical research areas regarding mackerels relate to the adequacy of sampling of the age structure of the stocks, the amount of mixing between management units, and increasing the precision associated with the mackerel assessment abundance indices. Because assessment and management are by necessity by geographical units, continued research on migration of king mackerel in particular is important.

An updated assessment of king and Spanish mackerel stock status was completed this year, including evaluations of stock status under various hypotheses about interchange rates between Gulf of Mexico and US Atlantic migratory groups. The results of the assessment were used to advise the Gulf and South Atlantic Fishery Management Councils on biologically appropriate harvest levels corresponding with the Councils' objectives for sustainable harvest.

Information on morphometry of wahoo (*Acanthocybium solandri*) based on US pelagic longline observer data was presented in SCRS/04/167.

2.2.6. Shark Research

The ICCAT Sub-Committee on Bycatches conducted an assessment of blue sharks and shortfin makos in Tokyo, Japan, in June 2004. The information available on biology, fisheries, stock structure, catch, catch rate, and size of these species was reviewed and an evaluation of the status of stocks conducted using surplus production, age-structured, and catch-free stock assessment models. Assessment results and conclusions were considered very preliminary because of the limitations on quantity and quality of information available for the stock assessment of these two species. The Group recommended increased research and monitoring efforts for sharks in particular and other bycatch species in general to improve the advice on their status as well as on the impacts of tuna fisheries on these species. In general, preliminary results for blue sharks indicated that current biomass in both the North and South Atlantic appears to be above the biomass at MSY. Current shortfin mako biomass may be below that producing MSY in the North Atlantic and above MSY in the South Atlantic, but results were highly conditional on the assumptions made and data available. US scientists contributed 8 working documents for this meeting on various aspects of shark biology and methods to assess stock status.

2.2.7. Billfish Research

The NMFS SEFSC again played a substantial role in the ICCAT Enhanced Research Program for Billfish in 2004, with SEFSC scientists acting as general coordinator and coordinator for the western Atlantic Ocean. Major accomplishments in 2003 were documented in SCRS/03/025. Highlights include 18 at-sea sampling with observers on Venezuelan industrial longline vessels in September, 2003. Of the trips accomplished to date, 5 observer trips were on Korean type vessels fishing under the Venezuelan flag. Most of these vessels are based out of Cumana targeting tuna, swordfish, or both at the same time. Biological sampling of swordfish, Istiophorids, and yellowfin tuna for reproductive and age determination studies, as well as genetics research were continued during the 2003 sampling season. Shore-based sampling of billfish landings for size frequency data, as well as tournament sampling were obtained from Venezuela, Grenada, U.S. Virgin Islands, Bermuda, Barbados, and Turks and Caicos Islands. Program participants in Venezuela, Grenada, and Barbados continued to assist in obtaining information on tag-recaptured billfish, as well as numerous sharks, in the Western Atlantic Ocean during 2003; a total of 75 tag recovered billfish and sharks were submitted to the Program Coordinator in 2003. Age, growth, and reproductive samples from several very large billfish were obtained during 2003.

A study conducted by the Virginia Institute of Marine Science (VIMS) to evaluate post release survival and habitat use of Atlantic white marlin using pop-up satellite archival tags (PSATs) continued in 2003. Short-duration (5 or 10 day) deployments of pop-up satellite archival tags were used to estimate survival of white marlin released from four locations in the western North Atlantic recreational fishery. Forty-one tags were attached to white marlin caught using dead baits rigged on straight-shank ("J") hooks (n = 21) or circle hooks (n = 20) offshore of the U.S. Mid-Atlantic region, the Dominican Republic, Mexico, and Venezuela. Survival was significantly ($p < 0.01$) higher for white marlin caught on circle hooks (100%) relative to those caught on straight shank ("J") hooks (65%). These results, along with previous studies on circle hook performance, suggest that a simple change in hook type can significantly increase the survival of white marlin released from recreational fishing gear. Data from these short term deployments also suggest that white marlin strongly associated with warm, near surface waters. However, based on the frequency, persistence, and patterns of vertical movements, white marlin appear to direct a considerable proportion of foraging effort well below surface waters, a behavior that may account for relatively high catch rates of white marlin on some pelagic longline deployments.

A separate study conducted by VIMS is also being done on U.S. longline vessels to evaluate post release survival of marlin, as well as evaluating hook performance and related mortality. In addition, hook timers and time-depth-recorders are being used to examine the depth distribution and performance of the fishing gear. To date over 90 sets on longline vessels have been completed but preliminary analyses are not yet available.

The SEFSC has conducted several studies in the Northwest Atlantic and the Pacific coast of Central America to evaluate habitat use and reproductive biology of billfish using PSAT technology. About 200 PSATs have been deployed in this effort over the last 2/3 years with deployments ranging from a month to 5.5 months. Several peer review papers are under review at this time, while other papers are currently in preparation. In addition, SEFSC is also currently conducting pelagic longline research to evaluate gear behavior, and the effects of gear modification on catch rate and survival of target and non-target species. Two cruises have been completed to date.

The Fishery Management Group of the University of Miami is carrying out research on Atlantic billfish on three areas, population parameter estimation, population modeling and development of socio-economic indicators.

2.2.8 Tagging

Participants in the Southeast Fisheries Science Center's Cooperative Tagging Center (CTC) and the Billfish Foundation Tagging Program (TBF) tagged and released 4,829 billfishes (including swordfish) and 608 tunas in 2003. This represents a decrease of about 43% for billfish and a decrease of 9% for tunas from 2002 levels. A number of electronic tagging studies involving bluefin tuna and billfish were also carried out in 2003. These are discussed in the bluefin and billfish research sections above.

There were 118 billfish recaptures from the CTC and TBF reported in 2003, representing a decrease of 44% from 2002. Among the 2003 CTC billfish recaptures there were 16 blue marlin, 4 white marlin, 32 sailfish, 9 swordfish, and 5 striped marlin. For the CTC and TBF, a total of 23 tunas were recorded recaptured in 2003; these were 215 bluefin, 6 yellowfin, 1 albacore, and 1 blackfin tuna. These recaptures represent a 38% decrease with respect to year 2002 values. The ICCAT Enhanced Research Program for Billfish (IERPBF) in the western Atlantic Ocean has continued to assistance in reporting tag recaptures to improve the quantity and quality of tag recapture reports, particularly from Venezuela, Barbados and Grenada. A total of 75 billfish and 5 shark tag recaptures were reported from the IERPBF during 2003.

2.2.9 Fishery Observer Deployments

Domestic Longline Observer Coverage. In accordance with ICCAT recommendations, randomized observer sampling of the U.S. large pelagic longline fleet was continued into 2003 (see Appendix Figure 2.2-

Observers). Representative scientific observer sampling of this fleet has been underway since 1992. The data collected through this program have been used to quantify the composition, disposition, and quantity of the total catch (both retained and discarded at sea) by this fleet which fishes in waters of the northwest Atlantic Ocean, Gulf of Mexico, and the Caribbean Sea. Selection of the vessels is based on a random, 8% sampling of the number of sets reported by the longline fleet. A total of 6,982 sets (5,153,550 hooks) were recorded observed by personnel from the SEFSC and NEFSC programs from May of 1992 to December of 2003. Observers recorded over 379,354 fish (primarily swordfish, tunas, and sharks), in addition to marine mammals, turtles, and seabirds during this time period. The percent of fleet coverage through 2003 ranged from 2.5% in 1992 to 8.8% in 2002. Fleet effort for 2003 has not been finalized, but percent observer coverage is estimated near 8% for the year. Sampling fraction of the U.S. pelagic longline fleet was increased in 2002 to 8%. Document SCRS/04/168 provides a more detailed summary of the data resulting from observer sampling between 1992 and 2002.

In 2001 through 2003, an experimental gear design study was initiated in cooperation with the U.S. pelagic long line fleet with a history of fishing on the Grand Banks of the North Atlantic, to develop gear modifications that might prove useful in reducing the rate of interaction and limit severity of injury to marine turtles incidentally captured while at the same time minimizing loss of the targeted catch. The gear modifications being tested include the type of bait used, color of bait (dyes), the size and type of hooks used (circle vs. J-style vs. various hook offsets), as well as the positioning of hooks relative to surface floats. It was ~~is~~ viewed that these technologies could have application to the international longline fleets. During these three years, 100% observer coverage was required of the participanting vessels. Results of these gear design experiments are available at http://www.mslabs.noaa.gov/mslabs/docs/pubs.html.

Southeast U.S. Shark Drift Gillnet Fishery Observer Coverage.

The directed shark gillnet fishery is currently comprised of four to six vessels that operate year round in coastal waters from Georgia to Florida (USA). Sharks are the primary target species. Observations of this fishery have been conducted by on-board observers from 1993-1995 and 1998-present and reports of the catch and bycatch from these observations are available. In 2003, Observers spent 116 days at sea and observed 65 sets.

Foreign Fishery Observers.

There was no foreign fishing activity in the U.S. Exclusive Economic Zone (EEZ) off the east coast during 2003.

Appendix Table 2.1-YFT. Annual Landings (MT) of Yellowfin Tuna from 1999 to 2003.

Area	Gear	1999	2000	2001	2002	2003
NW Atlantic	Longline	581	734	632	400	272
	Rod and reel*	3,818	3,809	3,691	2,624	4,672

	Troll	0	0	0	0	0
	Gillnet	0	0	8	5	1
	Trawl	4	2	3	0	2
	Handline	192	236	243	137	148
	Trap	1	1	0	0	0
	Uncl	2	1	7	**	0
Gulf of Mexico	Longline	2,737	2,133	1,506	2,109	1,828
	Rod and reel*	149	52	494	200	640
	Handline	13	29	43	100	59
	Gillnet	**	0	0	0	0
Caribbean	Longline	24	12	23	12	7
	Rod and reel*			0.1	7.2	16
	Troll	0	0	0	0	0
	Handline	15	19	14	7	9
	Gillnet	0	0	0	0	**
	Trap	0	0	0	0	0
NC Area 94a	Longline	0	2	4	0	5
SW Atlantic	Longline	32	20	36	52	42
All Gears & Areas		7,569	7,051	6,703	5,653	7,701

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** ≤= 0.05 MT

Appendix Table 2.1-SKJ. Landings (MT) of Skipjack Tuna from 1999 to 2003

Area	Gear	1999	2000	2001	2002	2003
NW Atlantic	Longline	0.3	0.0	0.1	**	0.9
	Rod and reel*	63.6	13.1	32.9	23.3	34.0
	Troll	0.0	0.0	0.0	0.0	0.0
	Gillnet	26.5	1.9	3.6	**	0.9
	Trawl	1.0	0.0	0.2	**	0.5
	Handline	0.2	0.2	0.2	0.2	0.2
	Trap	17.5	0.0	0.0	**	1.5
Gulf of Mexico	Longline	0.4	0.2	0.2	**	**
	Rod and reel*	34.8	16.7	16.1	13.2	11.0
	Handline	0.4	0.7	0.0	0.0	**
	Uncl	0.0	0.0	0.0	0.0	0.0
Caribbean	Longline	1.3	1.6	4.0	2.5	3.3
	Rod and reel*			0.0	13.2	15.7
	Gillnet	0.4	0.6	1.6	0.6	0.4
	Handline	5.8	8.8	10.3	12.5	9.2
	Trap	0.1	0.3	0.4	0.7	0.2
	Trol	0.0	0.0	0.0	0.0	0.0
SW Atlantic	Longline	0.0	0.0	0.0	0.0	0.0
All Gears & Areas		152.3	44.1	69.5	66.2	77.8

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** $\leq$ 0.05 MT

Appendix Table 2.1-BET. Landings (MT) of Bigeye tuna by year for 1999-2003.

Area	Gear	1999	2000	2001	2002	2003
NW Atlantic	Longline	737.8	333.2	506.1	328.6	168.7
	Rod and reel*	316.1	34.4	366.2	49.6	188.5
	Troll	0.0	0.0	0.0	0.0	0.0
	Gillnet	0.2	0.0	0.2	0.0	0.0
	Handline	11.9	4.1	33.2	13.8	6.0
	Trawl	1.2	1.7	0.4	0.5	**
	Pound	0.0	0.0	0.0	0.0	0.1
	Uncl	0.9	0.0	1.8	0.0	0.0
Gulf of Mexico	Longline	54.6	44.5	15.3	41.0	27.5
	Rod and reel*	1.8	0.0	0.0	0.0	0.0
	Handline	0.2	0.1	0.5	0.6	0.3
Caribbean	Longline	23.2	13.7	31.9	29.7	7.2
	Rod and reel*			0.0	0.0	4.0
	Handline	0.2	1.5	0.0	0.0	0.0
NC Area 94a	Longline	35.3	63.1	61.0	45.2	36.9
SW Atlantic	Longline	78.2	77.4	68.2	91.3	44.6
All Gears & Areas		1261.6	573.6	1084.7	600.3	483.8

* Rod and Reel catches and landings represent estimates of landings and dead discards based on statistical surveys of the U.S. recreational harvesting sector.
** <= 0.05 MT

Appendix Table 2.2-BFT. Landings (MT) of Bluefin tuna for 1999 to 2003.

Area	Gear	1999	2000	2001	2002	2003
NW Atlantic	Longline	25.1	22.8	17.7	7.8	16.3
	Handline	15.5	3.2	9.0	4.5	2.5
	Purse Seine	247.9	275.2	195.9	207.7	265.4
	Harp	115.8	184.2	101.9	55.5	87.9
	* Rod and reel (>145 cm LJFL)	657.5	632.8	993.4	1001.7	676.4
	* Rod and reel (<145 cm LJFL)	103.0	49.5	242.9	519.4	314.6
	Uncl	0.1	0.2	0.5	0.0	0.0
Gulf of Mexico	Longline	48.4	43.3	19.8	32.8	53.8
	* Rod and reel	0.4	0.9	1.7	1.5	0.0
NC Area 94a	Longline	0.0	0.0	0.0	9.3	11.3
	All Gears	1,213.7	1,278.6	1,582.8	1,840.3	1,428.0

Appendix Table 2.2-ALB. Landings (MT) of Albacore tuna for 1999 to 2003.

Area	Gear	1999	2000	2001	2002	2003
NW Atlantic	Longline	179.5	130.5	171.7	124.0	95.6
	Gillnet	27.0	0.8	3.3	2.6	0.1
	Handline	0.6	2.9	1.7	3.9	1.4
	Trawl	0.4	0.0	0.0	0.3	**
	Troll	0.0	0.0	0.0	0.0	0.0
	Rod and reel*	90.1	250.8	122.3	323.0	333.8
	Pound	0.4	0.0	0.0	0.0	0.0
	Uncl	0.0	0.1	0.1	0.0	0.0
Gulf of Mexico	Longline	3.8	4.1	4.9	9.5	7.7
	Rod and reel*	0.0	0.0	0.0	0.0	0.0
	Handline	**	0.0	0.0	0.0	**
Caribbean	Longline	8.3	9.2	8.7	8.4	4.0
	Trol	0.0	0.0	0.0	0.0	0.0
	Gillnet	0.2	0.1	0.5	**	**
	Trap	**	0.2	0.3	0.6	0.2
	Handline	3.8	5.0	2.2	2.7	2.0
NC Area 94a	Longline	1.5	2.6	6.1	4.8	1.6
SW Atlantic	Longline	1.4	0.9	2.4	8.3	2.0
	All Gears & Areas	317	407.35	324.2	488.1	448.4

** <= 0.05 MT * Rod and Reel catches and landings represent estimates of landings and dead discards when available based on statistical surveys of the U.S. recreational harvesting sector.

Appendix Table 2.3-SWO. Catches and Landings (MT) of Swordfish for 1998 to 2003.

Area	Gear	1999	2000	2001	2002	2003
NW Atlantic	* Longline	1,872.3	1,547.6	1,220.8	1,132.8	1,347.0
	Gillnet	0.0	0.0	0.0	0.1	0.0
	Handline	5.0	7.7	8.6	8.8	10.2
	Trawl	7.5	10.9	2.5	3.9	6.0
	* unclassified	3.8	1.4	1.8	0.1	0.0
	Harpoon	0.0	0.6	7.4	2.8	0.0
	Rod and Reel***	21.3	15.6	1.5	21.5	5.1
	Trap	**	0.0	0.0	**	0.1
Gulf of Mexico	* Longline	579.6	631.7	494.6	549.1	515.8
	Handline	**	1.2	0.3	2.9	1.5
Caribbean	* Longline	260.5	331.9	347.0	329.0	276.4
	Trap	0.0	0.3	0.0	0.1	**
NC Atlantic	* Longline	650.0	804.6	420.6	587.9	632.9
S Atlantic	* Longline	185.2	143.8	43.2	199.9	20.9
	All Gears& Areas	3,585.2	3,497.1	2,568.4	2,846.4	2,821.2

* includes landings and estimated discards from scientific observer and logbook sampling programs.
** $\leq$ = 0.5 MT
*** Rod and Reel catches and landings represent estimates of landings and dead discards when available based on statistical surveys of the U.S. recreational harvesting sector.

Appendix Table 2.6a-SHK. Estimates of U.S. commercial and recreational landings and dead discards for pelagic sharks in the U.S. Atlantic, Gulf of Mexico, and Caribbean.

	Commercial					Recreational			Discards			Total	
Year	mt (ww) [1]	mt (dw) [2]	lb (dw) [3]	av. weight[4]	number [5]	number [6]	av. weight[7]	lb (dw)	number	mt (ww)	lb (dw) [8]	number	lb (dw)
1981						12,603	50.035	630,591				12,603	630,591
1982	45.41	23.17	51,077		1,354	20,015	50.996	1,020,685				21,369	1,071,762
1983	51.89	26.47	58,367		1,627	21,968	117.64	2,584,316				23,595	2,642,683
1984	49.12	25.06	55,250		1,538	23,295	67.489	1,572,156				24,833	1,627,406
1985	57.99	29.59	65,227		1,969	92,998	38.224	3,554,756				94,967	3,619,982
1986	68.50	34.95	77,049	66.850	2,385	42,572	65.631	2,794,043				44,957	2,871,091
1987	87.46	44.62	98,375	69.171	2,786	37,153	39.002	1,449,041	13,092	560.64	630,606	53,031	2,178,022
1988	129.48	66.06	145,639	68.958	3,915	32,993	41.271	1,361,654	13,655	468.74	527,237	50,563	2,034,530
1989	141.36	72.12	159,001	57.574	4,937	18,255	73.228	1,336,777	13,480	538.21	605,376	36,672	2,101,155
1990	102.74	52.42	115,566	67.221	3,274	11,630	41.246	479,691	13,955	795.97	895,300	28,859	1,490,557
1991	114.32	58.33	128,587	76.681	3,290	10,070	62.061	624,954	17,232	813.21	914,695	30,592	1,668,236
1992	139.81	71.33	157,258	73.737	4,111	16,304	39.219	639,427	8,939	298.31	335,538	29,354	1,132,222
1993	387.30	197.60	435,638	81.631	5,278	29,861	50.988	1,522,553	30,545	1,191.52	1,340,217	65,684	3,298,407
1994	513.46	261.97	577,535	82.713	6,688	5,638	68.280	384,963	13,410	637.71	717,294	25,736	1,679,791
1995	393.93	200.98	720,219	75.676	9,517	32,673	47.629	1,556,182	10,864	710.27	798,909	53,054	3,075,310
1996	402.03	205.12	760,364	81.934	9,280	18,534	33.697	624,540	22,153	949.22	1,067,682	49,967	2,452,586
1997	381.08	194.43	537,594	85.937	6,256	8,743	54.834	479,414	7,754	250.42	281,671	22,753	1,298,679
1998	267.07	136.26	505,275	83.184	6,074	11,762	35.977	423,161	6,002	280.09	315,044	23,838	1,243,480
1999	113.10	57.70	376,471	88.388	4,259	11,122	48.304	537,237	3,464	117.63	132,310	18,845	1,046,018
2000	191.15	97.53	350,705	69.280	5,062	13,346	16.749	223,532	7,495	216.13	243,102	25,903	817,339
2001	192.43	98.18	361,667	62.978	5,743	3,820	83.938	320,643	6,158	155.75	175,187	15,721	857,497
2002	174.06	88.81	305,637	60.717	5,034	4,732	87.152	412,403	5,335	92.73	104,302	15,101	822,343

[1] From weighout data sheets; [2] Wet weight to dry weight conversion ratio is 1.96; [3] 1982-1994 data are from weighout data sheets, 1995-2002 data are the maximum of the combined southeast quota monitoring program/southeast and northeast general canvass estimate and the weighout estimate; [4] In pounds dressed weight from weighout data sheets; [5] 1982-1994 data are taken directly from weighout data sheets,1995-2002 data obtained as the maximum of dividing values in fourth column (lb dw) by those in fifth column (av. weight) and the estimated number of sharks landed from the weighout data sheets; [6] Almost all recreational landings are from the MRFSS survey, for 2000-2002 data from Headboat and TXPWD were not yet available; [7] In pounds dressed weight; [8] Wet weight to dry weight conversion ratio is 1.96.

Appendix Table 2.6b-SHK Estimates of commercial and recreational landings and dead discards for blue sharks in the U.S. Atlantic, Gulf of Mexico, and Caribbean.

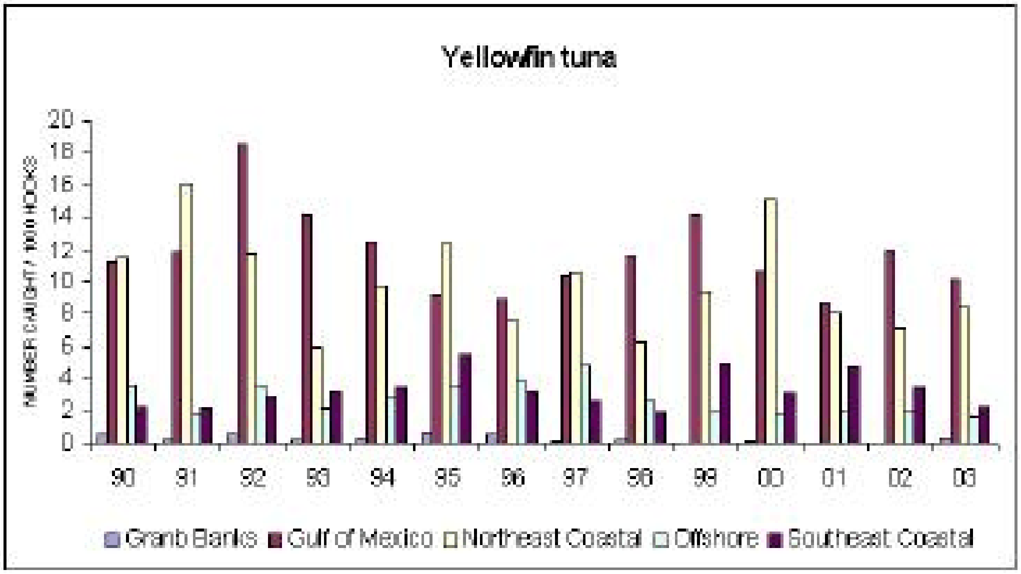
	Commercial					Recreational			Discards			Total	
Year	mt (ww) [1]	mt (dw) [2]	lb (dw) [3]	av. weight[4]	number [5]	number [6]	av. weight[7]	lb (dw)	number	mt (ww)	lb (dw) [8]	number	lb (dw)
1981						4,925	46.653	229,766				4,925	229,766
1982	0	0	0		0	0	46.653	0				0	0
1983	0	0	0		0	14,593	46.653	680,807				14,593	680,807
1984	0	0	0		0	2,579	46.653	120,318				2,579	120,318
1985	0	0	0		0	11,621	33.003	383,528				11,621	383,528
1986	0.40	0.20	450	148.500	6	18,898	66.182	1,250,707				18,904	1,251,157
1987	0	0	0	56.412	0	20,683	47.545	983,373	12,506	526.2	591,868	33,189	1,575,241
1988	0.10	0.05	112	56.412	4	12,235	32.62	399,106	12,934	421.16	473,719	25,173	872,937
1989	0	0	0	56.412	0	7,419	41.011	304,261	12,525	480	539,902	19,944	844,163
1990	0.25	0.13	286	56.412	6	1,745	56.134	97,954	13,141	741.33	833,845	14,892	932,084
1991	0	0	0	56.412	0	6,643	52.12	346,233	16,562	772.32	868,702	23,205	1,214,936
1992	0.47	0.24	529	67.769	14	5,853	41.191	241,091	7,043	184.39	207,401	12,910	449,021
1993	7.88	4.02	8860	75.188	85	14,114	53.567	756,045	29,329	1,136.33	1,278,139	43,528	2,043,044
1994	7.82	3.99	8796	79.960	105	507	46.653	23,653	11,986	572.24	643,653	12,598	676,103
1995	3.61	1.84	4059	66.557	61	464	46.653	21,647	9,725	618.15	695,293	10,250	720,998
1996	5.40	2.76	17920	70.819	253	9,150	34.07	311,741	18,996	710.69	799,381	28,399	1,129,042
1997	1.42	0.72	1598	52.933	31	4,236	55.74	236,115	6,614	184.605	207,643	10,881	445,356
1998	2.87	1.46	3228	40.873	79	6,085	46.653	283,884	5,295	195.25	219,616	11,459	506,728
1999	0.16	0.08	1111	6.725	165	5,218	46.653	243,435	2,772	98.96	111,310	8,155	355,856
2000	0.61	0.31	3508	62.634	56	7,010	46.653	327,038	6,298	137.19	154,311	13,364	484,856
2001	3.09	1.58	3476	40.579	86	950	46.653	44,320	5,219	105.87	119,082	6,255	166,879
2002	0.20	0.10	225	56.500	4	0	46.653	0	4,335	67.87	76,340	4,339	76,565

[1] From weighout data sheets; [2] Wet weight to dry weight conversion ratio is 1.96; [3] 1982-1994 data are from weighout data sheets, 1995-2002 data are the maximum of the combined southeast quota monitoring program/southeast and northeast general canvass estimate and the weighout estimate; [4] In pounds dressed weight from weighout data sheets, values for 1987-1991 are taken as the mean of 1992-2002 values; [5] 1982-1994 data are taken directly from weighout data sheets,1995-2002 data obtained as the maximum of dividing values in fourth column (lb dw) by those in fifth column (av. weight) and the estimated number of sharks landed from the weighout data sheets; [6] Almost all recreational landings are from the MRFSS survey, for 2000-2002 data from Headboat and TXPWD were not yet available; [7] In pounds dressed weight, values for 1981-84, 1994-95, and 1998-2002 are taken as the mean of 1985-93 and 1996-97 values for which n>=5; [8] Wet weight to dry weight conversion ratio is 1.96.

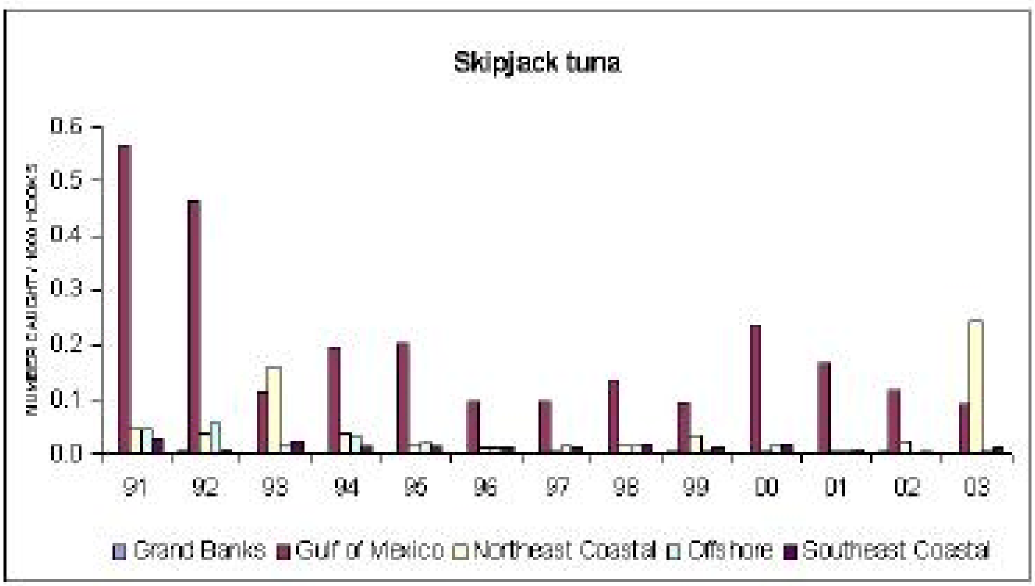
Appendix Table 2.6c-SHK. Estimates of commercial and recreational landings and dead discards for shortfin makos in the U.S. Atlantic, Gulf of Mexico, and Caribbean.

	Commercial					Recreational			Discards			Total	
Year	mt (ww) [1]	mt (dw) [2]	lb (dw) [3]	av. weight[4]	number [5]	number [6]	av. weight[7]	lb (dw)	number	mt (ww)	lb (dw) [8]	number	lb (dw)
1981						7,678	56.395	433,001				7,678	433,001
1982	42.12	21.49	47,376		1298	13,522	50.996	689,568				14,820	736,944
1983	6.78	3.46	7,626		225	7,375	56.141	414,039				7,600	421,665
1984	42.46	21.66	47,759		1436	15,474	67.531	1,044,975				16,910	1,092,734
1985	53.24	27.16	59,884		1877	79,912	41.487	3,315,309				81,789	3,375,193
1986	64.76	33.04	72,842	64.9361	2,318	20,792	70.107	1,457,665				23,110	1,530,507
1987	77.84	39.71	87,554	65.7712	2,592	14,809	35.069	519,337	217	8.72	9,808	17,618	616,699
1988	101.37	51.72	114,021	63.0954	3,398	19,998	44.693	893,771	127	5.08	5,714	23,523	1,013,505
1989	124.56	63.55	140,105	55.771	4,608	8,367	90.117	754,009	249	9.01	10,134	13,224	904,248
1990	91.77	46.82	103,223	63.8425	3,081	8,509	35.483	301,925	259	10.307	11,593	11,849	416,741
1991	104.87	53.51	117,957	75.5015	3,085	3,422	69.020	236,186	245	11.16	12,553	6,752	366,697
1992	125.97	64.27	141,691	71.8326	3,782	8,382	33.589	281,543	771	38.41	43,203	12,935	466,437
1993	281.09	143.41	316,164	77.355	4,044	15,034	49.883	749,941	562	24.03	27,029	19,640	1,093,134
1994	324.66	165.64	365,177	76.7173	4,623	4,496	79.296	356,515	558	21.45	24,127	9,677	745,818
1995	288.83	147.36	324,870	71.2094	4,562	31,212	51.227	1,598,897	446	28.44	31,989	36,220	1,955,756
1996	238.05	121.46	267,762	83.2385	3,217	8,618	30.265	260,824	0	0	0	11,835	528,586
1997	245.46	125.23	276,089	84.574	3,264	3,025	60.839	184,038	0	0	0	6,289	460,127
1998	199.76	101.92	224,689	82.327	2,729	5,633	29.590	166,680	0	0	0	8,362	391,370
1999	90.05	45.94	150,073	87.763	2,262	1,383	56.141	77,643	0	0	0	3,645	227,716
2000	166.74	85.07	187,546	66.185	2,836	5,808	56.141	326,066	0	0	0	8,644	513,613
2001	182.02	92.87	204,735	63.154	3,242	2,870	83.938	240,902	0	0	0	6,112	445,637
2002	165.59	84.48	186,255	61.024	3,060	3,199	87.152	278,799	0	0	0	6,259	465,054

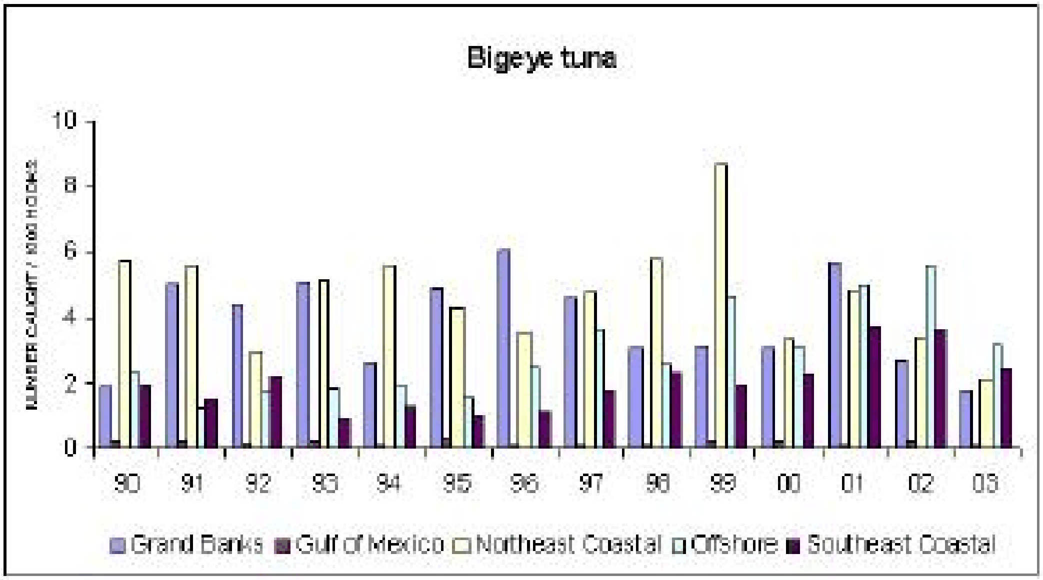
[1] From weighout data sheets; [2] Wet weight to dry weight conversion ratio is 1.96; [3] 1982-1994 data are from weighout data sheets, 1995-2002 data are the maximum of the combined southeast quota monitoring program/southeast and northeast general canvass estimate and the weighout estimate; [4] In pounds dressed weight from weighout data sheets; [5] 1982-1994 data are taken directly from weighout data sheets,1995-2002 data obtained as the maximum of dividing values in fourth column (lb dw) by those in fifth column (av. weight) and the estimated number of sharks landed from the weighout data sheets; [6] Almost all recreational landings are from the MRFSS survey, for 2000-2002 data from Headboat and TXPWD were not yet available; [7] In pounds dressed weight, values for 1983 and 1999-2000 are taken as the mean of 1981-82, 1984-98, and 2001-02 values for which n>=5; [8] Wet weight to dry weight conversion ratio is 1.96.



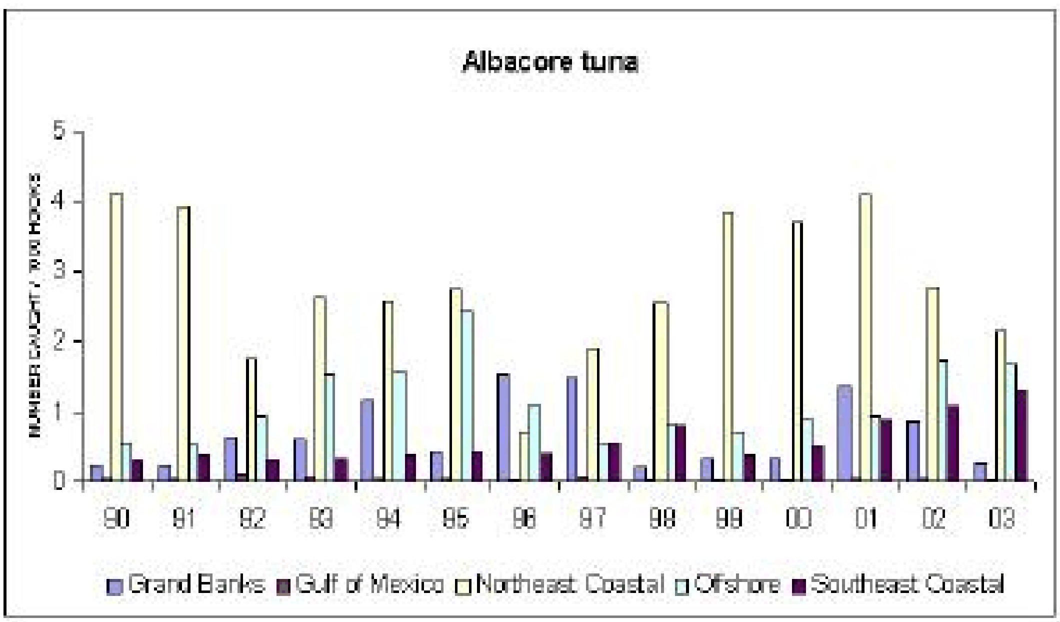
Appendix Figure 2.1-YFT. Nominal catch rates for YFT in US Longline logbook reports.



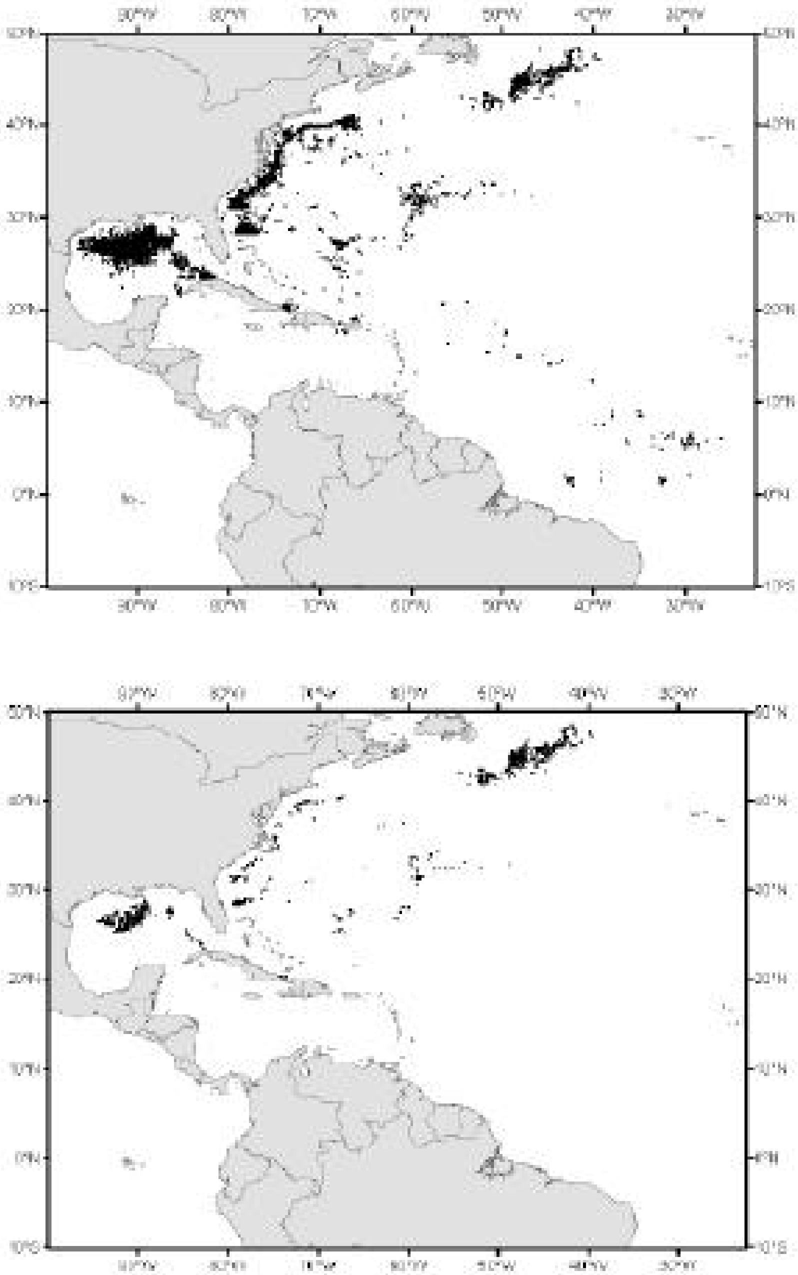
Appendix Figure 2.1-SKJ. Nominal catch rates for SKJ in US Longline logbook reports.



Appendix Figure 2.1-BET. Nominal catch rates for BET in US Longline logbook reports.



Appendix Figure 2.2 - ALB. Nominal catch rates for ALB in US Longline logbook reports.

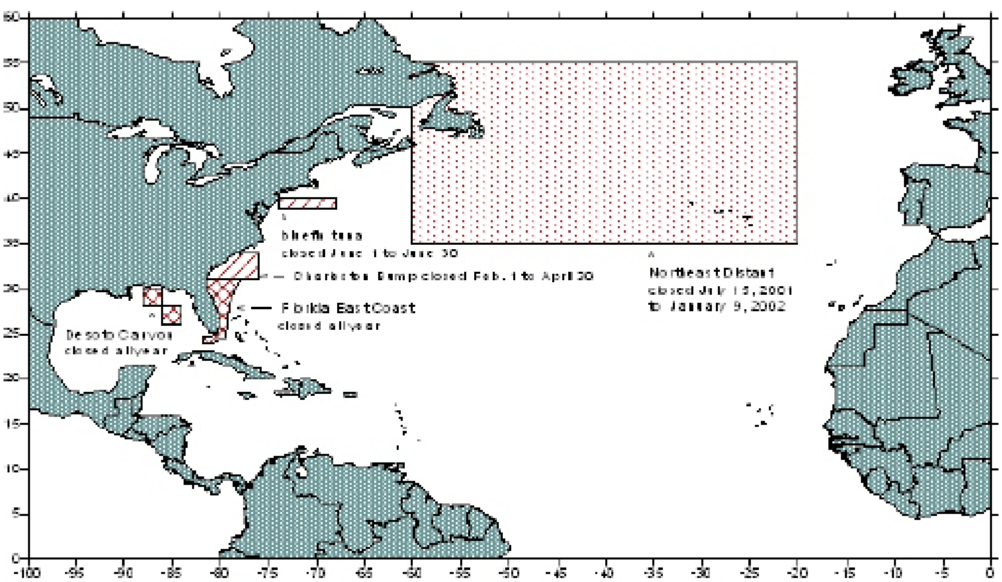


Appendix Figure 2.2 -Observers. Reported (upper) and observed (lower) longline positions in 2003.

***Appendix SWO*. *Affect of minimum size and time/area closures on U.S. swordfish catch*.**

In addition to minimum size restrictions, beginning in the year, 2001, U.S pelagic longline fishing was prohibited or restricted in the five areas and times shown in Figure 1. The three southern areas, (Charleston Bump, Florida East Coast, and Desoto Canyon), were selected, at least in part, to reduce the catch of swordfish < 125 cm and other bycatch. The bluefin tuna area was closed primarily to reduce the catch of bluefin smaller than legal size for sale by U.S. fishers. Longline vessels were allowed to fish in the Northeast Distant area if they participated in a turtle study and carried an observer. In 2002 the Northeast Distant area was closed all year to vessels not participating in the turtle study.

The number of longline vessels in the U.S. fishery targeting swordfish has declined steadily since the mid 1990's. Reported effort (hooks) declined initially but has remained fairly stable since 1998 (Table 1). The percentage effort in hooks and the catch of swordfish < 125 cm in numbers (reported) and in metric tons (estimated) in 2001, 2002, and 2003 are compared to the average effort and catch from 1997 through 1999 (Table 2). There was some overall reduction in effort, reported in hooks fished. Some of the effort previously reported from the Florida East Coast fishing area appears to have redistributed into the Gulf of Mexico and up to the south Atlantic and Mid Atlantic Bights. The years 2001, 2002, and 2003 and the average (1997-1999) catch of swordfish < 125 cm in numbers (reported) and in metric tons (estimated) and effort in hooks are reported by area and time/area status in Table 3. Although the metric tons of swordfish < 125 cm estimated caught increased in some areas compared to the 1997-99 average, notably the Caribbean and the Gulf of Mexico, the overall change in estimates was a reduction of nearly 50% in both years.



Appendix Figure 1. Time area closures for the U.S. Atlantic pelagic longline fleet.

Table 1. *Numbers of Active Vessels.* "Fished" implies a vessel submitted at least one positive fishing report during that year, "Caught Swordfish" means the vessel reported catching at least one swordfish during that year and "Caught Swordfish in 5 months" means the vessel reported catching at least one swordfish per month in at least five months of that year. "Hooks Reported" includes all submitted logbooks whether or not they represented single pelagic longline sets, summary records, bottom longline records, or sets with less than 100 hooks fished.

NUMBERS OF ACTIVE VESSELS

YEAR	FISHED	CAUGHT SWORDFISH	CAUGHT SWORDFISH IN 5 MONTHS	HOOKS REPORTED
1987	297	273	180	6,558,426
1988	388	338	210	7,009,358
1989	456	415	251	7,927,401
1990	419	363	209	7,500,095
1991	342	308	176	7,754,127
1992	340	304	184	9,076,717
1993	435	306	177	9,735,806
1994	501	306	176	10,351,805
1995	489	314	198	11,270,539
1996	367	275	191	10,944,660
1997	352	265	167	10,213,780
1998	288	233	139	8,120,273
1999	226	200	143	7,996,685
2000	206	185	135	8,158,390
2001	185	168	114	7,897,037
2002	149	140	107	7,107,958
2003	123	119	94	6,862,091

Table 2. Catch in numbers (reported) and in metric tons (estimated) of swordfish < 125 cm and reported number of hooks in years 2001-2003 by longline gear expressed as percentage of the mean from years 1997-1999 by area Caribbean (CAR), Florida East coast (FEC), Gulf of Mexico (GOM), Mid Atlantic Bight (MAB), Northeast Central (NEC), Northest Distant (NED), and South Atlantic Bight (SAB).

	Number of swordfish				Number of hooks				Metric tons.			
	Mean	2001	2002	2003	Mean	2001	2002	2003	Mean	2001	2002	2003
CAR	434	70 %	74 %	36 %	237,280	84 %	53 %	48 %	11	136 %	154 %	36 %
FEC	2,500	18 %	11 %	17 %	619,099	67 %	73 %	73 %	118	31 %	16 %	18 %
GOM	1,820	124 %	130 %	113 %	2,858,863	103 %	102 %	109 %	68	100 %	143 %	111 %
MAB	1,213	115 %	137 %	94 %	1,008,860	94 %	86 %	53 %	51	59 %	96 %	37 %
NEC	769	102 %	68 %	62 %	734,782	114 %	72 %	53 %	30	163 %	37 %	53 %
NED	983	86 %	38 %	53 %	497,606	61 %	87 %	116 %	36	44 %	17 %	31 %
SAB	2,412	47%	37 %	60 %	601,499	103 %	58 %	77 %	139	50 %	37 %	85 %

Table 3. Catch in numbers (reported) and in metric tons (estimated) of swordfish < 125 cm and number of hooks reported by longline gear in year 2001-2003 and the average for years 1997-1999 by area Caribbean (CAR) , Florida East coast (FEC), Gulf of Mexico (GOM), Mid Atlantic Bight (MAB), Northeast Central (NEC), Northest Distant (NED), and South Atlantic Bight (SAB) and status of time/area closure.

		Number of swordfish (reported)				Number of Hooks (reported)				Mt (estimated)				change in mt		
		Mean	2001	2002	2003	Mean	2001	2002	2003	Mean	2001	2002	2003	2001	2002	2003
CAR	open	434	303	323	155	237,280	200,243	125,812	113,176	11	15	17	4	4	6	-7
FEC	closed	2,364	338	93	237	475,733	158,407	151,235	282,842	112	28	6	11	-84	-106	-101
FEC	open	136	103	191	198	143,366	258,779	302,461	172,071	6	9	13	10	3	7	4
GOM	closed	426	25	5	0	237,572	20,900	13,635	8,750	19	1	0	0	-18	-19	-19
GOM	open	1,394	2,226	2,370	2,052	2,621,292	2,918,899	2,902,425	3,102,043	49	67	97	76	18	48	27
MAB	closed	2	0	0	0	6,250	400	0	0	0	0	0	0	0	0	0
MAB	open	1,211	1,396	1,662	1,134	1,002,610	950,998	861,128	530,713	51	30	49	19	-21	-2	-32
NEC	closed	11	0	0	0	41,150	0	0	0	0	0	0	0	0	0	0
NEC	open	769	785	519	477	734,782	834,239	530,595	388,706	30	49	11	16	19	-19	-14
NED	closed	983	843	370	516	496,806	303,750	431,691	576,727	36	16	6	11	-20	-30	-25
NED	open	0	0	0	8	800	1,672		2,858	0	0	0	0	0	0	0
SAB	closed	939	105	23	10	216,264	58,587	5,176	5,660	58	6	1	0	-52	-57	-58
SAB	open	1,474	1,036	870	1,438	385,236	561,014	343,710	458,775	81	63	51	118	-18	-30	37
Total	closed	4,719	1,311	491	763	1,473,775	542,044	601,737	873,979	225	51	13	22	-174	-212	-203
Total	open	5,933	5,849	5,935	5,454	5,125,366	5,725,844	5,066,131	4,768,342	244	233	238	243	-11	-6	-1

Appendix 3.1-BFT. Information on research on bluefin tuna stock structure using microconstituents and isotopes in otoliths.

Since 1998, U.S., Canadian, European, and Japanese scientists have initiated cooperative research on the feasibility of using otolith microconstituents to distinguish bluefin stocks. Progress includes: 1. Coordinated sampling to obtain juveniles from principal nursery areas; 2. Field and laboratory protocols for chemical analysis of bluefin tuna otoliths (Secor and Zdanowicz 1998; Rooker et al. 2001). 3. An inter-laboratory test for elemental signature differences between juvenile Atlantic bluefin tuna collected in western and eastern Atlantic nursery regions (Secor et al. 2002). 4. Evaluation of intra-nursery stability in elemental fingerprints across different spatial and time scales (Rooker et al. 2001; 2002; 2003). 5. Development of a micromilling procedure for core isolation. 6. Development and tests on methods to measure trace transition metals in otoliths (Arslan and Paulson 2003). Using earth and transition metals in otoliths, juveniles from either nursery area (W. Atlantic or Mediterranean) were separated with moderate success with classification rates ranging between 60 to 80% (Rooker et al. 2003; Secor et al. 2002). Inter-annual differences in elemental fingerprints were significant but inter-laboratory precision was high. Protocols are now in place to permit classification of adults by nursery habitats based upon micromilling of core regions and decontamination procedures.

Recent research has focused on the use of otolith 13C and $d^{18}O$ isotopes to distinguish nursery habitats. In particular, $d^{18}O$ should vary between the Mediterranean and the west Atlantic. The cooler Mediterranean should lead to an enriched level of $d^{18}O$ based upon kinetic considerations as well as empirical evidence (Thorrold et al. 1997; Gao et al. 2001). Preliminary findings suggest that $d^{18}O$ isotopes may be a powerful and reliable marker of nursery origin. For juveniles collected in 1999 and 2000, $d^{18}O$ of Atlantic bluefin tuna collected in the Western Atlantic and Mediterranean were markedly different with no overlap between nurseries, and this difference was stable across the two years. Further, stable isotope values of otolith cores from medium and giant Atlantic tuna caught in the U.S. tended to delineate into either high or low $d^{18}O$ levels, indicative of origin in either the W. Atlantic or the Mediterranean. Ongoing research is directed at evaluating potential bias due to the micromilling procedure, further verification of nursery-specific $d^{18}O$ levels, and preliminary examinations of nursery origins for sub-adults and adults collected in from U.S. and Mediterranean coastal waters

Appendix 3.2-BFT. Summary of Bluefin Tuna Research 2002-2003

New England Aquarium and University of New Hampshire,
Molly Lutcavage, Principal Investigator,
Collaborators include Richard Brill, Steve Wilson, Julie Porter, Michael Genovese, Edward Murray, Anne Everly, Jennifer Goldstein, Scott Heppell, Chris Bridges, Nathaniel Newlands, Rob Schick, John Sibert, and Anders Nielsen

Between 17 July – 10 October, 2002, we released 67 light-sensing pop-up archival satellite tags (PTT-1000, Microwave Telemetry, Inc., Columbia, MD) on Atlantic bluefin tuna (size range 91- 272 kg) in the western North Atlantic. The majority of these tags were deployed in summer and autumn via the purse seine vessel White Dove Too in New England waters, and two tags were deployed in North Carolina in January, 2003. Although over half of the tags were shed before the programmed one year jettison date (June, 2003), we have long-term continuous data records for the remaining tags. The majority of the fish tagged in 2002 and 2003 are considerably smaller than the size classes tagged in previous years. After leaving New England, the majority of smaller fish (e.g., 91-136 kg) frequented the Mid-Atlantic Bight (off the Carolinas) from November to February, consistent with the winter NC bluefin fishery. A number of the larger bluefin (>180 kg) dispersed to the east, similar to results from previous years. After eight months, a NC fish (112 kg) was located off Newfoundland in August, 2003. Results from spatial and environmental analyses of all tagging data are being prepared for publication. Additional modifications completed by our collaborators John Sibert and Anders Nielson on the space state Kalman filter for determining "most probably track" from light-based archival data is being prepared for publication. In addition, an objective method for determining "most likely" premature shed date for early versions of the popup tags (that lacked depth sensors or fail-safes) has been developed so that movement information obtained from these early tags is more reliable. In 2003, so far we've deployed 59 psat tags on fish in the Gulf of Maine, and 12 tags on bluefin tuna captured and released from purse seiners off Turkey and Croatia. This work is being conducted as a research partnership with with Drs. Gregorio DeMetrio, Geoff Arnold, and other colleagues. Additional deployments are expected before the season ends. Significant efforts are underway with biomaterials experts to redesign tag anchors and tethers to maximize attachment durations. We are also testing new PSAT software that will help identify causes of premature shedding. In 2003, histological and hormonal analyses were completed on 160 Gulf of Maine bluefin tuna sampled by New England Aquarium researchers. In addition, over 30 samples have been obtained from US longliners from July- Aug, 2003, and fixed tissues have already been submitted to Dr. Scott Heppell for histological analysis. A manuscript examining the relationship of bluefin tuna schools to sea surface temperature fronts was accepted for publication in Fisheries Oceanography, and three other papers dealing with isotope ratios and food habits, biomass estimation, and movement models for bluefin tuna in the NW Atlantic have been submitted elsewhere. Environmental and spatial analyses of the Central North Atlantic cruise catch results will be undertaken at the University of New Hampshire, and stomach content analyses are expected to be completed this year. Larval samples of suspected scombrid larvae from the 2002 Eagle Eye Two cruise were sorted, digitally photographed, and submitted by the New England Aquarium researchers to Dr. Bill Richards and Dr. John Lamkin of SEFSC for larval identification. Subsamples were removed for species identification via genetic screening for Dr. John Graves' at

VIMS.

RECENT SUBMISSIONS

Gutenjunst, R., Newlands, N., Lutcavage, M., and L. Keshett. Inferring resource distributions from Atlantic bluefin tuna movements: an analysis based on net displacement and length of track. (Ecology)

Newlands, N., Lutcavage, M., and T. Pitcher. Abundance estimation of tuna populations: bias and uncertainty of movement, schooling, and aggregation. (ICES J, accepted pending revisions)

Estrada, J.A., Lutcavage, M., and S. Thorrold. Diet and trophic position inferred from stable carbon and nitrogen isotopes of Atlantic bluefin tuna (*Thunnus thynnus*)**.** (accepted, pending revisions, Marine Biology)

PUBLICATIONS

Wilson, S.G., Lutcavage, M.E., Brill, R.W., Genovese, M.P., Cooper, A. B, and A. Everly. Movements of bluefin tuna (*Thunnus thynnus*) in the northwestern Atlantic Ocean recorded by pop-up satellite archival tags. Marine Biology. *In press*

Schick, R.S., Goldstein, J., and M. Lutcavage. 2004 Bluefin tuna (*Thunnus thynnus*) distribution in relation to sea surface temperature fronts in the Gulf of Maine (1994-1996). Fisheries Oceanography, 13 (4).

Estrada, J.A., Rice, A.N., Skomal, G.B., and M. E. Lutcavage. 2004. Stable isotope analysis of shark species of the Atlantic ocean as a means of predicting trophic level and diet. J. exp Mar Biol and Ecol.

Newlands, N., Lutcavage, M.E., and T.J. Pitcher. Analysis of foraging movements of Atlantic bluefin tuna (*Thunnus thynnus*) I. Individuals switch between two modes of search behavior. J. Theoretical Ecol. *In press*

De Metrio, G, Oray, I., Arnold, GP, Lutcavage, M., Deflorio1, M, Cort, JL, Karakulak, S, Anbar, N and M. Ultanur. 2004. Joint Turkish-Italien research in the eastern Mediterranean: bluefin tuna tagging with PopUp satellite tags. SCRS/2003/125 Col. Vol. Sci. Pap. ICCAT, 56(3): 1163-1167.
.

Appendix . Report on the Electronic Tagging of Atlantic Bluefin Tuna:

The Tag-A-Giant Program in 2003

Barbara A. Block
Stanford University
Hopkins Marine Station

The goals of the Tag-A-Giant (TAG) program are to use a range of electronic tagging technologies to document the movements and behaviors of Atlantic bluefin tuna throughout their range, especially at their spawning and feeding grounds. The specific questions that are being addressed include elucidation of habitat preferences on spawning and feeding grounds, spawning site fidelity, and the level of mixing between eastern and western stocks in different regions where the bluefin appear to aggregate. An additional objective is to determine the influence of environmental parameters on behaviors, abundance and distribution of adolescent and mature bluefin tuna. The program continued placing tags internally and externally on Atlantic bluefin tuna in the North Atlantic. As of September 2003, over 750 electronic tags had been deployed in Atlantic bluefin tuna with 55% of these being surgically implanted archival tags. In 2003, experiments were designed for calculating the error around geolocation estimations. By conducting double tagging experiments using ARGOS based tags versus electronic tags that use light and sea surface temperature data to estimate positions, the TAG team has acquired a robust statistical system for position estimation. This is the first step required prior to temporal and spatial modeling of the tag results and will ensure quality control occurs upon publication.

North Carolina

To elucidate long term records of behavior TAG scientists have primarily focused on using archival tags. Archival tags have been improving over the past few years with the manufacturers meeting new design criteria. The major goal of continued deployments on bluefin tuna is to discern fidelity to feeding and breeding grounds. By obtaining multi-year records it is assumed that answers to the questions of when and where bluefin breed can be ascertained. To date the most reliable place to surgically implant an archival tag has been off the coast of North Carolina. In 2003 tag scientists worked 11 fishing days in winter conditions off the coast of North Carolina and deployed 107 implantable archival tags and 16 external pop up satellite tags. Many of the fish were double tagged to ascertain if any mortality had occurred. There was no mortality indicated from the pop-up satellite tagged fish.
Most of the tags deployed in 2003 thus far were implantable archival tags of a new generation (Lotek, 2310 LTD tag) capable of recording positions and time series data on pressure, light, internal and external temperature for 5-10 years. A single tag from this recent deployment has been recovered by Spanish fishers to the east of the stock boundary line after deployment in North Carolina in January (see attachment). In addition, the 107 archival tags were implanted in bluefin of a mean size greater than 8 years of age.

Of the 16 pop-up tags deployed, to date, 65% of the pop-up satellite tags have released at durations of 5-9 months post deployment. A single pop-up satellite tag is in the eastern Atlantic post-reporting while all others are in New England or Canadian waters or along the Gulf Stream. This results is consistent with five years of results from the same region. The main result is that pop up satellite tagged fish tagged in the Carolina winter assemblage, report within 9 months most often in the western Atlantic and off the New England or Canadian coastline. As in years past, a small percentage (<10% of reporting tags) of bluefin tuna tagged in Carolina move directly into feeding grounds east of the Flemish Cap and south of Greenland.

Recovery of North Carolina released implantable archival tags deployed in previous years. Recovery of implantable archival tags has been relatively slow in the summer of 2003. Currently a total of 69 of the 1996-1999 deployed tags, n of 279 tags (24.7%) have reported. A single archival tag (516) deployed in January 1999 was recovered in Italy in June 2003. Spanish scientists recovered an archival tag (1013) from the newer deployments of 2002 (n= 28) and 2003 (n=107).

New England
The results from the pop-up tagging of 35 bluefin tuna have been collated and submitted to a peer review journal. The major results of this paper indicate movements of Atlantic bluefin tuna due south of the release point off Nantucket, Massachusetts. Tags provided data from 1 to 9 months post release and showed primary linkage of this assemblage to offshore waters of the Carolinas and to points south off the North American continental shelf. Two fish showed movements into the Gulf of Mexico breeding ground. Continued efforts to tag fish in this location are on going. A problem with premature release was apparent in the New England data set and due to inclusion of pressure sensors on the generation of pop-up tags deployed, it could readily be detected. Tags that detached prematurely drifted to mid-Atlantic positions.

Gulf of Mexico
The data from the Gulf of Mexico effort to tag breeding assemblages of bluefin tuna from 1999-2002 has been partially analyzed and several publications for peer review are currently being prepared for submission to journals in 2003. Scientific operations in the Gulf of Mexico included 112 sets with the mean hooks per set of 186 + 91. The mean soak times for sets was 2.6 h. Scientists captured 1.78 bluefin per 1000 hooks set in the Gulf and had 0.6 mortalities per 1000 hooks. Mortality of bluefin was difficult to prevent even with short soak times. This research combined with physiological research on going in our laboratory on live bluefin tuna suggests an important finding. We have demonstrated that warm temperatures such as those found in the Gulf of Mexico breeding ground, place the Atlantic bluefin tuna in a high stress physiological situation. The bluefin is endothermic and in warm waters where oxygen is limiting, the physiology of the bluefin demands for oxygen increase. The capture of the large giants, in warm waters increases their physiological stress and most likely results in the mortality we have encountered. To accommodate the problem, scientific longlining was reduced to very short sets with short soak times (1.2 h). We have recorded with electronic tags body temperatures and ambient water temperatures above 33ºC and 31ºC respectively, in bluefin tuna in the Gulf of Mexico.

Mediterranean and Eastern Atlantic: To address questions about mixing and spawning site fidelity, it is important to tag giant bluefin tuna at various sites around the Atlantic Ocean TAG scientists are collaborating with Irish, French and Tunisian scientists to further the knowledge of electronic tagging and to combine resources and expertise for east Atlantic and Mediterranean deployments.

Peer Reviewed Papers Submitted or In preparation

1) Validation of Geolocation Estimates Based on Light Level and Sea Surface Temperature from Electronic tags. S. Teo, A. Boustany, S. Blackwell, A. Walli, K. Weng and B.A. Block

2) Movements and Behavior of Atlantic bluefin tuna (*Thunnus Thynnus*) Revealed with Implantable Archival Tags. A.Walli, S.Teo, H. Dewar, A. Boustany, C. Farwell, T. Williams, E. Prince and B.A. Block

3) Movements of Atlantic bluefin tuna (*Thunnus thynnus*) Satellite Tagged off New England. M.J.W. Stokesbury, A. Seitz, S. Teo, R. K. O'Dor and B.A. Block

4) Pop-Up Satellite Tagging Reveals Movements and Behavior of Bluefin tagged off the North Carolina coast. A. Boustany, S.Teo, K.Weng, C. Farwell and B.A. Block

5) Electronic Tagging of Atlantic Bluefin Tuna in the Gulf of Mexico Breeding Ground
B.A. Block, A. Boustany, S.L. Teo, A. Seitz and E. Prince

Recent Abstracts of Papers Presented:
Stokesbury, M.J., Seitz, A., Teo, S., O'Dor, R.K., and Block, B.A. 2003. Western residency of satellite tagged Atlantic bluefin tuna (*Thunnus thynnus*) tagged off New England. pp. 271. Abstracts, American Fisheries Society 133rd Annual Meeting, Quebec City,

August 10-14.

Appendix 3.4-BFT. Summary of research in progress to develop stock assessment models to support management of Atlantic bluefin tuna in a six-area, two-stock, multi-fleet context

McAllister, Murdoch[1], Babcock, Elizabeth[2], Apostolaki, Panayiota[1]

The following research activities are currently in progress to develop stock assessment models to support management of Atlantic bluefin tuna in a six-area, two-stock, multi-fleet context.

1. A discussion paper outlining bluefin tuna research produced by McAllister, Babcock, Apostolaki, and Pikitch for the SCRS meeting to discuss development of a research proposal for a large-scale ICCAT Bluefin Tuna Research Program in May has been elaborated. This updated version further elaborates the modeling and data analysis work that this group has initiated to support the proposed new -six-area management regime. It describes the components of the fishery management evaluation framework that the group is building in collaboration with the Sustainable Fisheries Division Southeast Fisheries Science Center and others in the US delegation. These model components include an operating model component that model plausible scenarios for the underlying dynamics of the overall fishery management system. The elements of the operating model include firstly, a six-area, two-stock, quarterly time step multi-fleet population dynamics model (described in the second paper, below). Secondly, an observation error model is proposed, that simulates plausible error structures in the observation that are gathered to be used in stock assessment and fishery management harvest control rules. Thirdly, a fishery management implementation model is proposed to model the implementation of the annual management controls imposed. As well as the operating model, the fishery management system evaluation framework will include a harvest control rule model that models the annual stock assessment and harvest control rule options. This simulates the annual evaluation of data collected from the system and the specification of e.g. TAC or fishing effort level in each area. The annual management decision is fed into the implementation model of the operation model which then models how the decision is actually carried out. The impacts on population dynamics are then implemented in the population dynamics model component of the operating model. This simulation-evaluation framework will thus permit the evaluation of the potential consequences of a large variety of stock assessment and harvest control rules over a variety of plausible scenarios for population dynamics including migration. The paper also outlines new approaches to statistically analyzing the different types of tagging data (conventional, pop-up and archival) to estimate values for parameters in the operating model such as movement rates between areas and age-, fleet-, area-, and season-dependent fishery catchabilities of bluefin tuna.

2. The model presented in SCRS/02/88, which was a fleet disaggregated, age- and sex-structured two-stock model and simulated the mixing of the two Atlantic bluefin tuna stocks and their movement between areas, was updated with new information from the 2002 assessment. The virgin biomass and productivity parameters for both stocks were adjusted so that the 6-area model could reproduce the trends in spawning stock biomass *(SSB)* estimated in the 2002 base case VPA models for the eastern and western stocks. The model was then run again under various migration scenarios, to determine what virgin spawning stock biomass would need to be assumed to allow the model to predict the same biomass in 2000 as was predicted by the VPA models. The 6-area model could not reproduce the increasing trend in recruitment that the VPA models estimated for the eastern stock in 2002, but it could reproduce the western stock biomass trend, and could reproduce the eastern stock trend estimated in the 1998 assessment. Under the migration models considered, the trend in (SSB) for the eastern stock was not greatly influenced by the migration model assumed. However, for the western stock, if eastern fish were assumed to migrate into the western areas, the virgin biomass of western stock was predicted to be lower, as was the current depletion of the population, while if western fish were assumed to migrate into the eastern area, the virgin biomass of the western stock was estimated to be less productive than it appeared to be without migration, implying a longer time for the western stock to recover. This model is presented as a proposed operating model for six-area bluefin fisheries management strategy evaluaiton. It is also proposed that this model will be developed as a stock assessment model to be fitted to catch-age data, tagging data, micro-constituent data, and relative abundance indices.

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THE U.S. NATIONAL PLAN OF ACTION FOR REDUCING THE INCIDENTAL CATCH OF SEABIRDS IN LONGLINE FISHERIES (NPOA): ITS IMPLMENTATION IN THE U.S. ATLANTIC TUNA, SWORDFISH, AND SHARK LONGLINE FISHERIES

ICCAT Resolution on Incidental Mortality of Seabirds

At its 2002 annual meeting, ICCAT adopted a Resolution on Incidental Mortality of Seabirds (Resolution 02-14). The resolution urges parties to inform ICCAT's Standing Committee on Research and Statistics (SCRS) and the Commission of the status of their National Plans of Action for Reducing Incidental Catches of Seabirds in Longline Fisheries (NPOA-Seabirds) and to implement such plans, where appropriate. Furthermore, the resolution encourages parties to collect and provide to SCRS all available information on interactions with seabirds, including incidental catches in all fisheries under the purview of ICCAT. The resolution further states that when feasible and appropriate, SCRS should present to the Commission an assessment of the impact of incidental catch of seabirds resulting from the activities of all the vessels fishing for tunas and tuna-like species, in the Convention Area. For additional information and a copy of the resolution, visit the ICCAT website at http://www.iccat.es/. The United States included seabird information in its 2003 National Report to ICCAT.

NPOA-Seabird Executive Summary

Increased concerns have arisen about the incidental capture of non-target species in various fisheries throughout the world. Incidental capture can be economically wasteful, it impacts living marine resources, and the accidental killing of non-harvested animals may be aesthetically aversive. Incidental catch of non-target marine species such as marine mammals, sea turtles, and seabirds has generated growing concern over the long-term ecological effects of such bycatch in longline and other fisheries conducted in many areas of the world's oceans.

The United States has voluntarily developed the U.S. *National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries* (NPOA-S) to fulfill a national responsibility to address seabird bycatch in longline fisheries, as requested in the *International Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries* (IPOA-S). The IPOA-S applies to "States" (hereafter Countries) in whose waters longline fishing is being conducted by their own or foreign vessels, and to Countries that conduct longline fishing on the high seas and in the exclusive economic zones (EEZs) of other Countries. The IPOA-S is a voluntary measure that calls on Countries to: (1) assess the degree of seabird bycatch in their longline fisheries; (2) develop individual national plans of action to reduce seabird bycatch in longline fisheries that have a seabird bycatch problem; and (3) develop a course of future research and action to reduce seabird bycatch. The NPOA-S is to be implemented consistent with the FAO *Code of Conduct for Responsible Fisheries* and all applicable rules of international law, and in conjunction with relevant international organizations.

Development of the NPOA-S was a collaborative effort between the National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (FWS) and the Department of State (DOS), carried out in large part by the Interagency Seabird Working Group (ISWG) consisting of representatives from those three agencies. This partnership approach recognizes the individual agency management authorities covering seabird interactions with longline fisheries. NMFS manages U.S. fisheries under the authority of the Magnuson-Stevens Fishery Conservation and Management Act and the High Seas Fishing Compliance Act. FWS manages birds predominately under the authority of the Endangered Species Act and the Migratory Bird Treaty Act. In addition, DOS has the lead role in international negotiations on fisheries conservation and management issues that should help promote IPOA implementation by encouraging other nations to develop NPOAs. Given each agency's responsibilities, the NPOA-S was developed collaboratively by NMFS and FWS. This collaborative effort has increased communication between seabird specialists and fishery managers in FWS and NMFS. Maintaining this cooperation is a high priority for both agencies.

The NPOA-S contains the following themes:

1. Action Items: NMFS, with the assistance of the Regional Fishery Management Councils (Councils), the NMFS Regional Science Centers, and FWS, as appropriate, should conduct the following activities:
    - Detailed assessments of its longline fisheries for seabird bycatch within 2 years of the adoption of the NPOA-S;
    - If a problem is found to exist within a longline fishery, measures to reduce this seabird bycatch should be implemented within 2 years. These measures should include data collection, prescription of mitigation measures, research and development of mitigation measures and methods, and outreach, education, and training about seabird bycatch; and
    - NMFS, in collaboration with the appropriate Councils and in consultation with FWS, will prepare an annual report on the status of seabird mortality for each longline fishery, including assessment information, mitigation measures, and research efforts. FWS will also provide regionally-based seabird population status information that will be included in the annual reports.

2.) Interagency Cooperation: The continuation, wherever possible, of the ongoing cooperative efforts between NMFS and FWS on seabird bycatch issues and research.

3.) International Cooperation: The United States' commitment, through the DOS, NMFS and FWS, to advocate the development of National Plans of Action within relevant international fora. The development of the NPOA-S has emphasized that all U.S. longline fisheries have unique characteristics, and that the solution to seabird bycatch issues will likely require a multi-faceted approach requiring different fishing techniques, the use of mitigating equipment, and education within the affected fisheries. Therefore, the NPOA-S does not prescribe specific mitigation measures for each longline fishery. Rather, this NPOA-S provides a framework of actions that NMFS, FWS, and the Councils, as appropriate, should undertake for each longline fishery. By working cooperatively, fishermen, managers, scientists, and the public may use this national framework to achieve a balanced solution to the seabird bycatch problem and thereby promote sustainable use of our nation's marine resources.

Detailed assessments should address the following:
• Criteria used to evaluate the need for seabird bycatch mitigation and management measures
• Longline fishing fleet data (numbers and characteristics of vessels)
• Fishing techniques data (demersal, pelagic, and other pertinent technical information)
• Fishing areas (by season and geographic location)
• Fishing effort data (seasons, species, catch, number of sets, and number of hooks/year/fishery)
• Status of seabird populations in the fishing areas, if known
• Estimated total annual seabird species-specific catch and catch-per-unit-effort (number/1,000 hooks set/species/fishery)
• Existing area and species-specific seabird bycatch mitigation measures and their effectiveness in reducing seabird bycatch
• Efforts to monitor seabird bycatch (e.g., observer program and logbooks), and
• Statement of conclusions and decision to develop and implement mitigation measures as needed.

Bycatch of Seabirds in Atlantic Tuna, Swordfish, and Shark Longline Fisheries

Introduction

The Secretary of Commerce manages Atlantic tunas, swordfish, and sharks - collectively known as highly migratory species or HMS - under the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks. The HMS FMP includes five species of Atlantic tunas (bluefin, yellowfin, albacore, bigeye, skipjack), swordfish, and 39 species of sharks in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. Longline fisheries for these species include the pelagic longline fishery for Atlantic tunas and swordfish and the bottom longline fishery for sharks. The HMS Management Division assesses seabird bycatch annually in the Stock Assessment and Fishery Evaluation Report.

Seabird Bycatch Assessment.

Atlantic pelagic longline fishery

Observer data from 1992 through 2003 indicate that bycatch is relatively low (Table 1). Since 1992, a total of 116 seabird interactions have been observed, with 79 seabirds observed killed in the Atlantic pelagic longline fishery. Approximately 120 active US pelagic longline vessels currently operate in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea.

Observed bycatch has ranged from 1 to 18 seabirds observed dead per year and 0 to 15 seabirds observed released alive per year from 1992 through 2003. Half of the seabirds observed have not been identified to species (n = 58). Of those seabirds identified, gulls represent the largest group (n = 29), followed by greater shearwaters (n = 19), and northern gannets (n = 8) (Table 2). Greater shearwaters experienced the highest mortality (100 percent), followed by gulls (76 percent), and unidentified seabirds (67 percent). Northern gannets had the lowest mortality rate (12 percent).

Preliminary estimates of expanded seabird bycatch and bycatch rates from 1995-2002, varied by year and species with no apparent pattern (Table 3). The estimated number of all seabirds caught and discarded dead ranged from 0 to 468 per year, while live discards ranged from 0 to 292 per year. The annual bycatch rate of birds discarded dead ranged from 0 to 0.0486 birds per 1,000 hooks while live discards ranged from 0 to 0.0303 birds per 1,000 hooks.

The Mid-Atlantic Bight experienced the highest number of seabirds observed caught and killed (n = 42, 90 percent). The Northeast Coastal area had the second highest number observed (n = 34) but third highest bycatch mortality (47 percent) compared to the South Atlantic Bight, which had a lower number of seabirds observed caught (n = 16) but higher mortality (81 percent).

Table 1. Seabird Bycatch in the U.S. Atlantic Pelagic Longline Fishery, 1992-2003. Source: NMFS Pelagic longline fishery observer program.

Year	Month	Area	Type of Bird	Number observed	Status
1992	10	MAB	GULL	4	dead
1992	10	MAB	SHEARWATER GREATER	2	dead
1993	2	SAB	GANNET NORTHERN	2	alive
1993	2	MAB	GANNET NORTHERN	2	alive
1993	2	MAB	GULL BLACK BACKED	1	alive
1993	2	MAB	GULL BLACK BACKED	3	dead
1993	11	MAB	GULL	1	alive
1994	6	MAB	SHEARWATER GREATER	3	dead
1994	8	MAB	SHEARWATER GREATER	1	dead
1994	11	MAB	GULL	4	dead
1994	12	MAB	GULL HERRING	7	dead
1995	7	MAB	SEA BIRD	5	dead
1995	8	GOM	SEA BIRD	1	dead
1995	10	MAB	STORM PETREL	1	dead
1995	11	NEC	GANNET NORTHERN	2	alive
1995	11	NEC	GULL	1	alive
1997	6	SAB	SEA BIRD	11	dead
1997	7	MAB	SEA BIRD	1	dead
1997	7	NEC	SEA BIRD	15	alive
1997	7	NEC	SEA BIRD	6	dead
1998	2	MAB	SEA BIRD	7	dead
1998	7	NEC	SEA BIRD	1	dead
1999	6	SAB	SEA BIRD	1	dead
2000	6	SAB	GULL LAUGHING	1	alive
2000	11	NEC	GANNET NORTHERN	1	dead
2001	6	NEC	SHEARWATER GREATER	7	dead
2001	7	NEC	SHEARWATER GREATER	1	dead
2002	7	NEC	SEABIRD	1	dead
2002	8	NED	SHEARWATER GREATER	1	dead
2002	8	NED	SEABIRD	1	dead
2002	9	NED	SHEARWATER GREATER	3	dead
2002	9	NED	SEABIRD	3	alive
2002	9	NED	SHEARWATER SPP	1	dead
2002	10	NED	GANNET NORTHERN	1	alive
2002	10	NED	SHEARWATER SPP	1	dead
2002	10	NED	SEABIRD	2	dead
2002	10	MAB	GULL	3	alive
2002	10	MAB	GULL	1	dead
2002	11	MAB	GULL	3	dead
2003	1	GOM	SEABIRD	1	alive
2003	8	NED	SEABIRD	1	dead
2003	9	MAB	SEABIRD	1	dead

MAB - Mid Atlantic Bight, SAB - South Atlantic Bight, NEC - Northeast Coastal, GOM - Gulf of Mexico, NED - Northeast Distant

Table 2. **Status of Seabird Bycatch in the U.S. Atlantic Pelagic Longline Fishery, 1992-2003.** Source: NMFS Pelagic longline fishery observer program.

Species	Release Status		Total	Percent Dead
	Dead	Alive		
GULLS (incl. Blackback, Herring, Laughing, and unid. gull)	22	7	29	75.9%
UNIDENTIFIED SEABIRD	39	19	58	67.2%
GREATER SHEARWATER	18	0	18	100%
SHEARWATER SPP	2	0	2	100%
NORTHERN GANNET	1	7	8	12.5%
STORM PETREL	1	0	1	100%
ALL SEABIRDS	83	33	116	71.6%

Atlantic bottom longline shark fishery

A single pelican has been observed killed from 1994 through 2003. The pelican was caught in January 1995 off the Florida Gulf Coast (between 25 18.68 N, 81 35.47 W and 25 19.11 N, 81 23.83 W) (G. Burgess, University of Florida, Commercial Shark Fishery Observer Program, pers. comm., 2001). No expanded estimates of seabird bycatch or catch rates are available for the bottom longline fishery.

Table 3. Expanded estimates of seabird bycatch and bycatch rates (discarded dead and discarded alive) in the U.S. Atlantic pelagic longline fishery, 1995-2002.

	1995		1996		1997		1998		1999		2000		2001		2002	
Species	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**	**D**	**A**
Unid. seabirds	134	0	0	0	468	292	155	0	14	0	0	0	0	0	3	3
Gulls	0	15	0	0	0	0	0	0	0	0	0	18	0	0	14	83
Shearwaters	0	0	0	0	0	0	0	0	0	0	0	0	210	0	6	0
Northern gannet	0	30	0	0	0	0	0	0	0	0	11	0	0	0	0	1
Storm petrel	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All seabirds	170	44	0	0	468	292	155	0	14	0	11	18	210	0	23	87
Total hooks set	10,182,297		10,310,708		9,637,807		8,019,183		7,901,789		7,975,529		7,563,951		7,150,231	
Bycatch rate	0.0167	0.0044	0	0	0.0486	0.0303	0.0194	0	0.0017	0	0.0014	0.0023	0.0278	0	0.0032	0.0121

D = released dead; A = released alive
Bycatch rate = number of seabirds per 1,000 hooks

Description of Fisheries

Atlantic pelagic longline fishery

There are approximately 120 active pelagic longline vessels currently operating in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. Fishermen target either swordfish (at night) or yellowfin and bigeye tuna (during the day). The nighttime fishery utilizes frozen bait (mackerel or squid, predominantly) and lightsticks. The daytime fishery had utilized frozen bait predominantly along the east coast and live bait in the Gulf of Mexico. However, NMFS prohibited the use of live bait on pelagic longline vessels in the Gulf of Mexico beginning in 2000 to minimize bycatch mortality of billfish. Additionally, NMFS prohibited pelagic longline fishing in the Florida East Coast, Charleston Bump, DeSoto Canyon, and Grand Banks areas beginning in 2000 and 2001 to reduce bycatch of swordfish, billfish, and sea turtles. In August 2004, NMFS limited vessels with pelagic longline gear onboard, at all times, in all areas open to pelagic longline fishing, excluding the NED, to possessing onboard and/or using only 16/0 or larger non-offset circle hooks and/or 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole finfish and squid baits may be possessed and/or utilized with allowable hooks. Effective the same time, NMFS opened the NED to pelagic longline fishing and limited vessels with pelagic longline gear onboard in that area, at all times, to possessing onboard and/or using only 18/0 or larger circle hooks with an offset not to exceed 10 degrees. Only whole mackerel and squid baits may be possessed and/or utilized with allowable hooks.

NMFS attempts to achieve five percent observer coverage (by number of sets) and has achieved approximately three to five percent annually between 1992 and 2000. Increased sampling in 2001, particularly in the Northeast Distant area, increased the sampling fraction to over 6 percent. Observer coverage in 2003 outside of the NED experimental fishery was approximately 6.5 percent with 100 percent observer coverage in the NED. Observers collect information about seabird bycatch by species and also take photographs of the birds. In addition, fishermen are required to submit logbooks for every trip made. Logbooks do not collect specific information about seabird bycatch at this time. Commercial pelagic longline fishing occurs throughout the North and South Atlantic, and the Gulf of Mexico.

Atlantic bottom longline shark fishery

There are approximately 250 bottom longline shark vessels currently operating in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. The Atlantic bottom longline fishery targets large coastal sharks, with landings dominated by sandbar and blacktip sharks. Gear characteristics vary by region, but in general, a ten-mile long monofilament bottom longline, containing about 750 hooks is fished overnight. Skates, sharks, or various finfishes are used as bait. This fishery operates subject to a limited large coastal shark quota, with a typical two to three-month long season starting in January and July. Commercial shark bottom longline fishing is concentrated in the southeastern United States and Gulf of Mexico. Vessel owners must submit logbooks for each shark fishing trip and are subject to observer coverage.

The Commercial Shark Fishery Observer Program (CSFOP) has documented approximately 4% of the entire U.S. Atlantic commercial large coastal shark landings and 1.6% of all hooks set by the shark bottom longline fishery over the first nine years of the program from 1994-2002. During the 2002 second semi-annual season and the 2003 first semi-annual season, six observers logged 311 sea days on 68 shark fishing trips aboard 22 vessels for 3.8% coverage of all commercial large coastal shark landings. During the 2002 first and second semi-annual seasons, the CSFOP observed 2.5% of all hooks reported set by the shark bottom longline fishery. Observers collect information about seabird bycatch. Starting in 2001, 20 percent of shark fishermen have been selected to submit a supplemental discard form, which includes information on seabird bycatch, as part of their standard logbook submissions.

Amendment 1 to the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks implements a time/area closure for bottom longline gear in the South Atlantic off the coast of North Carolina. The closure will be in effect from January to July beginning in January 2005. This measure was adopted to provide protection for dusky sharks, both juveniles and adults, and juvenile sandbar sharks. Although seabird bycatch in the bottom longline fishery is virtually non-existent, however, such a closure could afford additional protection for seabirds in that area.

Current Seabird Mitigation Efforts

No management measures are currently in place for seabird protection in either of these fisheries. Time/area closures for the pelagic longline fishery are in place in the Gulf of Mexico, along the east coast of Florida, in the Charleston Bump, in the Northeast Distant area, and in the Mid-Atlantic Bight. Such closures may positively affect seabirds. Evidence has been presented at international workshops that has indicated that, if necessary, streamer lines and line shooters are effective in reducing the bycatch of seabirds in longline fisheries.

Conclusion

Bycatch of seabirds in Atlantic HMS pelagic and bottom longline fisheries is relatively minimal and there does not appear to be a significant problem with seabird bycatch in these fisheries. Accordingly, no mitigation measures are proposed at this time. NMFS intends to continue to collect data on seabird bycatch through observer programs and supplemental logbooks programs and to increase the species-specific identification of seabirds observed. NMFS will reassess seabird bycatch in these fisheries as new information becomes available.

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